THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXII. No. 1842.] LONDON, AUGUST 30, 1898. [50TH YEAR. PRICE 6d.

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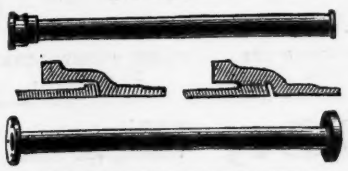
1¼ to 12 IN. BORE.



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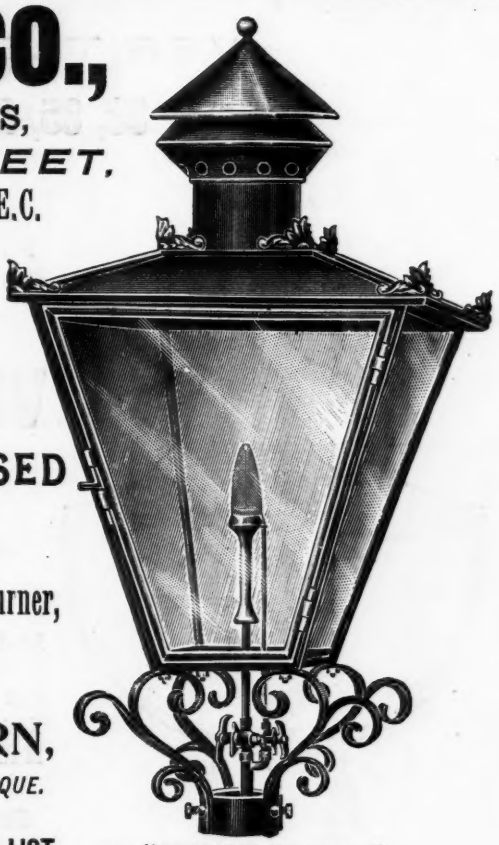

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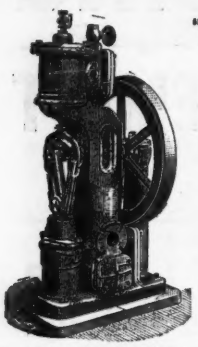

Fig. 709. "SINGLE RAM" STEAM-PUMP.

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

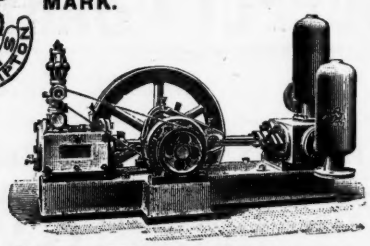

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

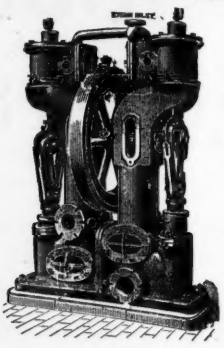

Fig. 712 "DOUBLE-RAM" STEAM-PUMP.

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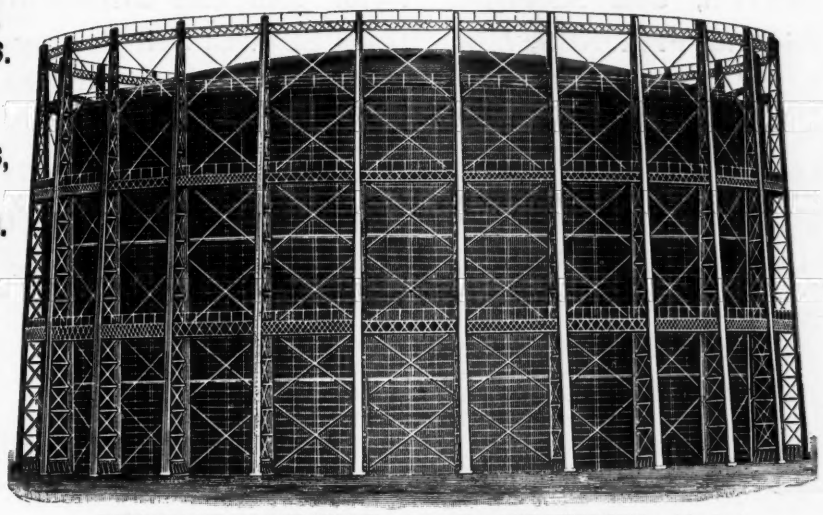

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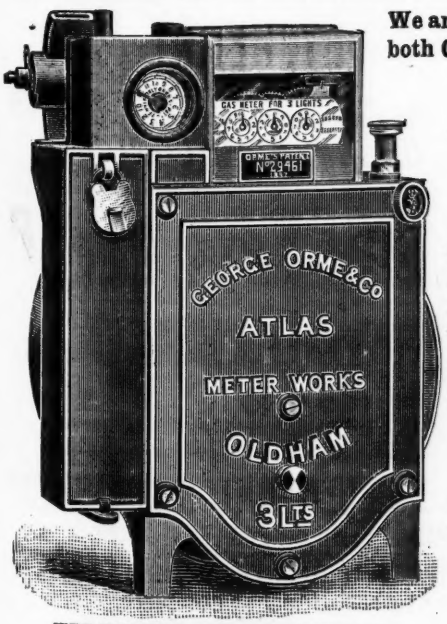

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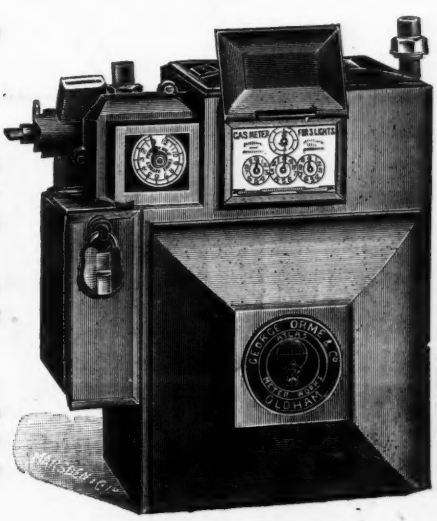

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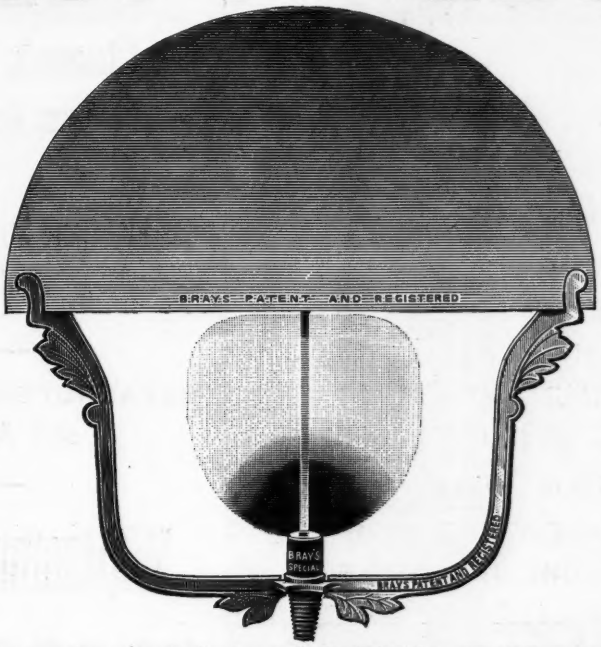

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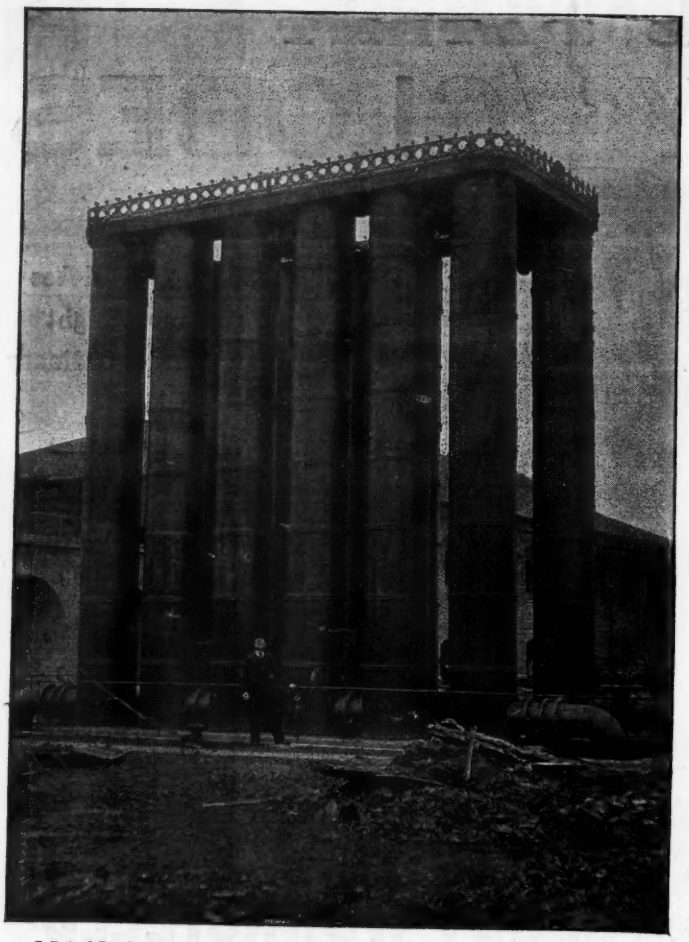

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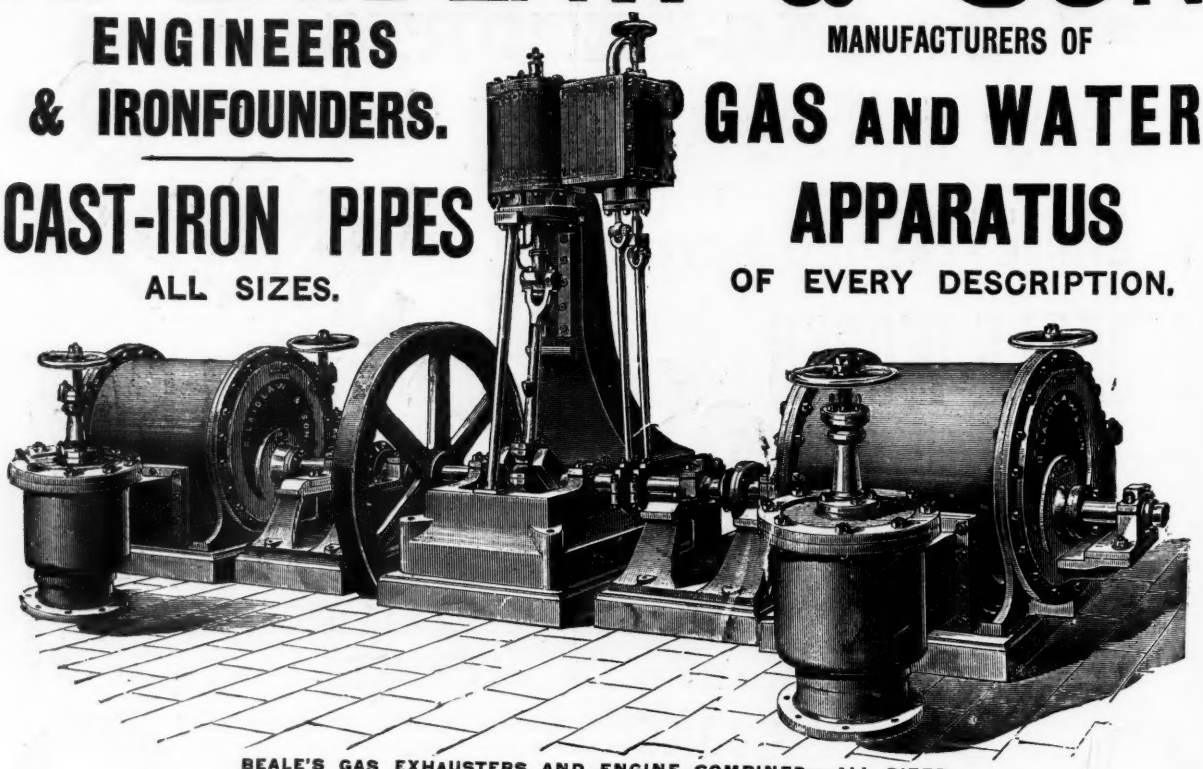

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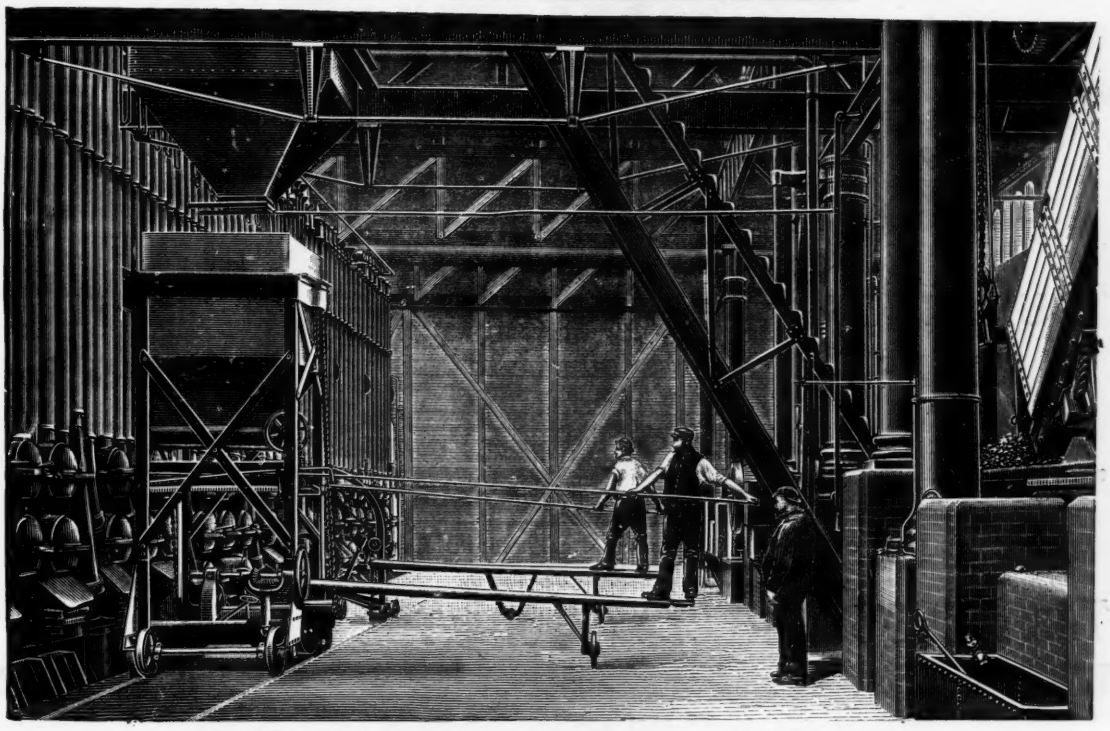

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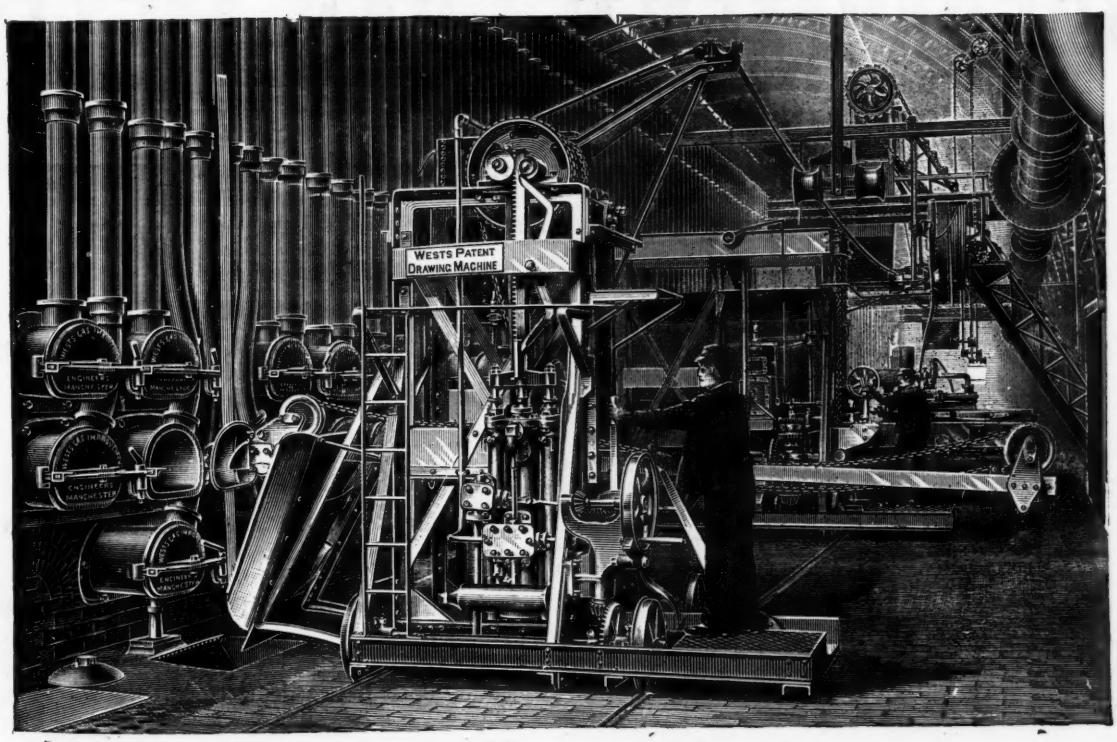

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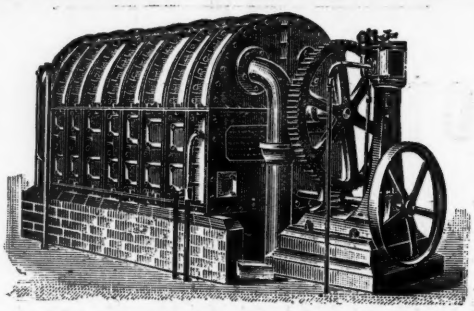

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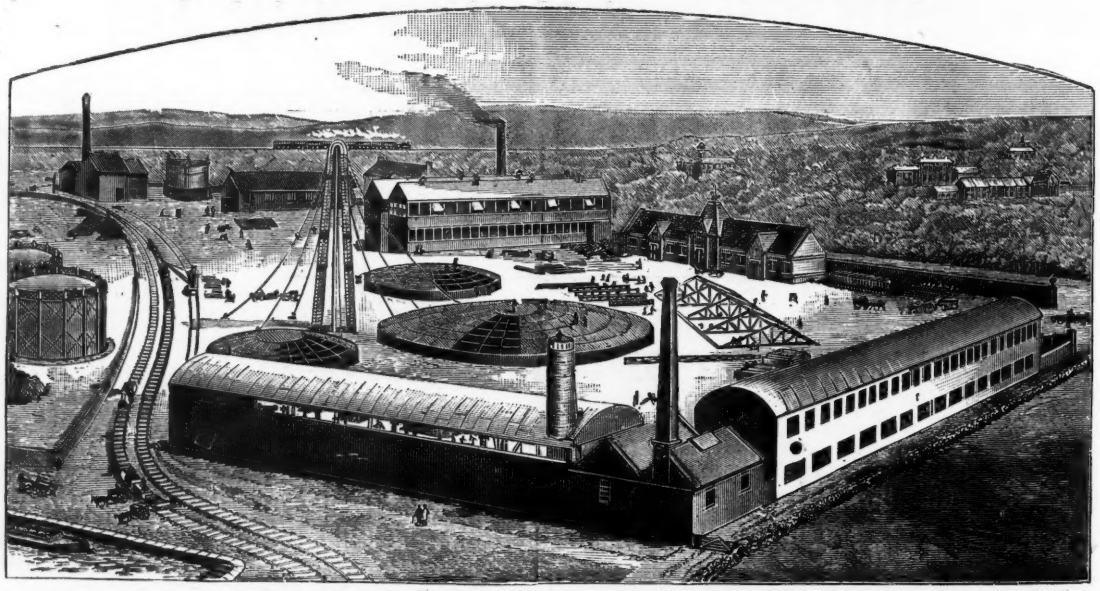

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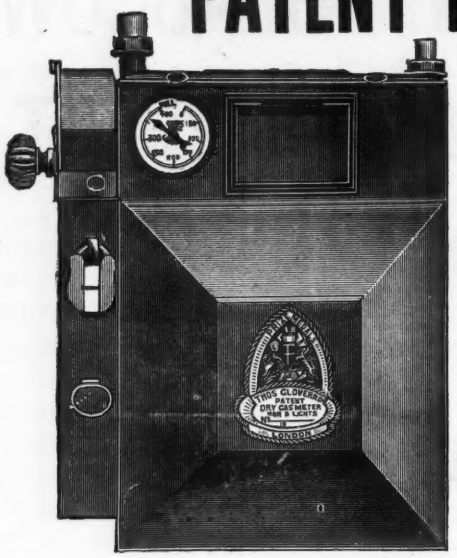

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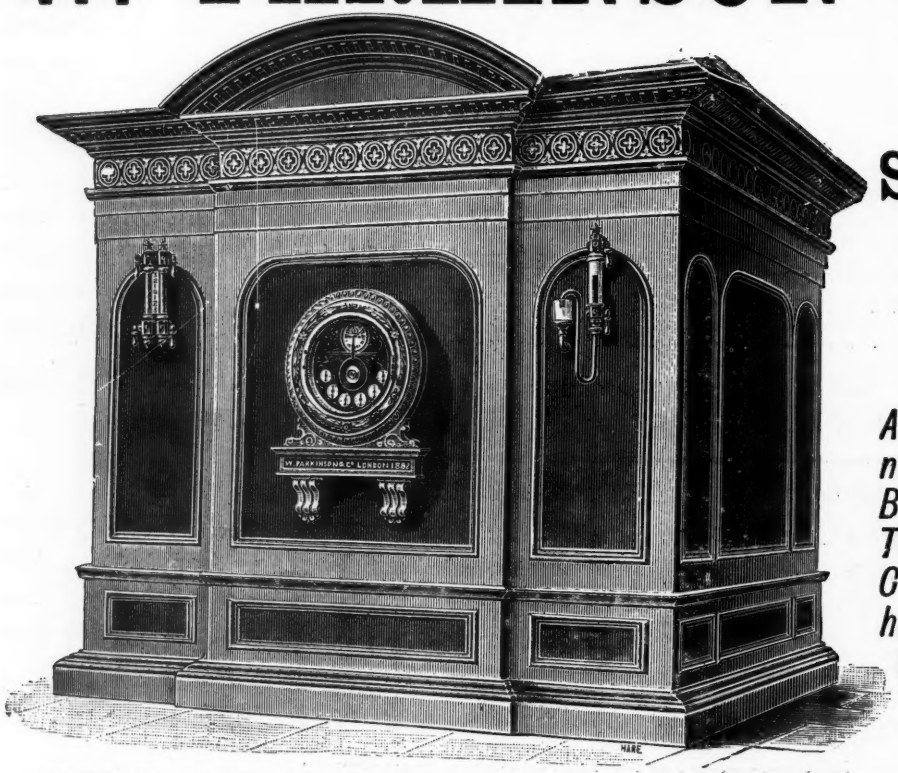

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EDITORIAL NOTES.

Multiplication or Unification in the Municipalization of London.

A NOTEWORTHY meeting of representatives of Metropolitan Local Authorities has recently been held to receive a report from a Committee appointed at a conference convened in June, to consider certain proposals for the creation of Metropolitan Municipalities. Bills to effect this purpose were promoted last session by Sir J. Blundell Maple and Mr. Thomas Lough. The Committee have examined the proposals of these measures, and have agreed upon a draft Bill embodying the best provisions of both, as well as introducing others. This is chiefly the joint work of the Chairman of the Committee (Mr. Wheeler, Q.C.) and the Honorary Secretary (Mr. Smith), aided by Sir J. Blundell Maple. The Bill is not put forward as a complete reform of the Metropolis Management Act, and all the Acts affecting local government in London. It is merely offered as an attempt to provide London with the opportunity of elevating its local administration from the existing grade of the "Vestry" to that of the "Municipality." The very notion of subdividing the Metropolis in this way for the sole purpose of local self-government is scouted by the "Progressives" of the London County Council, who deem themselves competent to do it all themselves—especially if they are first permitted to build a palace, and get control of the police. There are a few considerations peculiar to London, however, which Progressivism is apt to overlook. Possibly the party chiefly represented at the conference now under notice—which was presided over by Lord Onslow, who is the leader of the Moderate section of the London County Council—overrates these same considerations. The great thing is that they exist. First and foremost is the size and population of London. It is very difficult to realize the facts. One is prone to think of London as a great town, but not to remember that no other town of the Kingdom is to be named in the same breath with it as regards population. It does not help much to know that the area under the London County Council has a population equal to that of Portugal, and approaching that of Belgium. It is more to the point to observe that, with one or two exceptions, every one of twenty parishes scheduled as ripe for municipalization in the Bill is more populous than one or other of the thirty-three "great towns" of the Registrar-General's classification. Only three of the great English towns—Liverpool, Manchester, and Birmingham—surpass in rateable value the highest London parish total. The question is whether this statistical statement proves the case for multiple as against single municipalization. The view taken by "The Times" is that "these considerations alone are sufficient to show that the "county itself is too unwieldy to be subject to a single Muni- "cipality, and that the somewhat discredited Vestries ought "no longer to retain powers which in the past they have "not always exercised with any marked degree of effi- "ciency." The argument is not convincing. If the City of London had been reformed betimes, and had exhibited powers of natural growth in the same way as the Corporations of Glasgow or Liverpool, there would not have been this outcry against the unification of London municipal government on the score of the size or populousness of the area. The Lord Mayor would have served as the figure-head for all London as well as he now does for the City; and no London County Council would have been needed.

It is not the size of the one London local governing authority that is to be dreaded, but the artificiality of it. It is late in the day to make a local constitution for London, and then pretend that it is a natural growth. More than half the "Progressive" members of the London County Council have no natural connection with the constituencies which they are supposed to represent. It is the same with the other party. Would district Municipalities create that local patriotism which is so markedly deficient in the case of the existing Metropolitan Parish Authorities? It is impossible to answer such questions off-hand, or with any reference to *à priori* considerations of population and rateable value. St. Pancras may be richer and more populous than Rochdale; but this does not alter the facts that Rochdale is a self-centred town, while St. Pancras is only a name for a geographical division of a larger settlement which has its centre elsewhere.

The consideration that nobody proposes to disestablish the London County Council shows that, by common

consent, the London government must for some purposes be centralized. How far this centralizing principle can be usefully and economically carried, is a problem not easy of solution. Progressivism objects to the devolution of powers in Metropolitan self-government, because, for one reason, it would put a stop to the municipalization of the water and gas supply, the tramways, and many other services. But, on the other hand, it might be asked if an overweighted Central Municipality could be trusted to manage such enterprises successfully. Is it the fact that the London County Council has become nearly as officer-ridden as the Metropolitan Board of Works which it superseded, and for very much the same reasons? It is asserted of many of the functions of local government that, in so far as they have devolved upon the Council, they have been delegated to Committees, which have been so overloaded with work as to be in danger of getting through a good deal of it in a very perfunctory way, and of leaving to permanent officials, at the close of a protracted sitting, some of the matters which the members should have considered and decided themselves. This is the old story over again.

The Welsh Coal Strike.

Scarcely had our last week's prognostication as to the duration of the Welsh coal strike seen the light, than we stumbled upon several local newspaper articles dealing with the subject, one of which was actually headed "Settlement of the Coal Trade Dispute." This looked as if our gloomy forecast had already been disproved; but perusal of the article showed that the writer only meant to indicate the means whereby, in his opinion, a settlement might be arrived at. Such a title is, in these circumstances, misleading. There is no sense in crying "Peace!" when there is no peace. It appears matters are moving towards a settlement; but still the old obstacle of divided counsels among the men stands in the way of an agreement between them and the masters. It is locally reported, probably with truth, that the ostensible differences between the parties are no longer the actual ones. One by one the strikers have dropped the crude Collectivist "principles" which they had been persuaded to take into action with them, and they are believed to be willing to accept something like the masters' terms, if only the latter are based upon a minimum wage. It is suggested also that their original demand for an independent umpire as chairman of a new Conciliation Board might be modified in the sense of making the chairman merely an adviser, or go-between, without compulsory powers.

At the beginning of last week, it was reported from Cardiff that unless the men made up their minds within a few days as to what they wanted, the masters would be obliged to post notices stating that work in the pits could only be resumed at a further reduction of wages. The committal of two of the strike leaders to prison for intimidation appears to have had a sobering effect upon the others. The emigration of a number of Welsh strikers to the neighbourhood of Chesterfield, where they attempted to do a bit of "blacklegging" at the Shirebrook Colliery, which is the scene of a small local strike, evoked an indignant protest from the Derbyshire miners' agent. The Welshmen were notified that whatever it cost to send these travellers back again would be stopped out of the Derbyshire donation to Wales. The latest news from South Wales is that the men's Provisional Committee held a full meeting at Pontypridd on Thursday, at which the great majority favoured the immediate reopening of negotiations with the owners on the basis of a sliding-scale with a minimum; the men's representatives being given a free hand as to the amount of the latter. The Committee thereupon decided to ask the employers to meet them in conference on Saturday. This request was immediately granted; the owners' Committee being in session at the time. Accordingly, there was a joint conference on Saturday, when the men's representatives urged the employers to recognize the principle of a minimum wage. This, however, they declined to do. They offered the renewal of the old sliding-scale agreement, to continue in force till Jan. 1, 1902, and to be terminable at six months' notice on either side; the abolition of the monthly holiday; and an immediate advance of 5 per cent. above the wages in force on the 31st of March last. They also consented to add a clause granting the workmen the right to give six months' notice of the termination of the agreement at any time after Sept. 1, 1899, in case wages are ever reduced below 12½ per cent. above the standard of 1879. But, in view of this concession, they require that the terms of the agreement should be for four years from Jan. 1, 1898, instead of three years. The men were allowed until Thursday next to decide whether or not these terms should be accepted, which it is thought they will be.

Technical Instruction by the American Gaslight Association.

An interesting experiment is being tried in the United States, in the name of the American Gaslight Association. There has been in existence—for two or three years—a Committee of this Association on Education. We learn from our contemporary the "American Gaslight Journal" that this Committee has done useful work in a quiet way by teaching the principles of gas manufacture to those employees in American gas-works who desired to fit themselves for occupying minor positions of responsibility. As usual, the burden of this work fell to one man who was willing to take it. This was Mr. Walton Clark, a gas engineer known beyond the limits of his own country—wide and elastic as these are—as a sound technician endowed with the gift of adequate powers of expression. Mr. Clark now feels that he cannot continue this labour; and the knowledge that he was about to give it up has aroused some of his professional brethren to make a fresh effort involving the organization of this important work upon a firmer basis. Accordingly, the other members of the Committee have issued a circular inviting subscriptions from gas companies and engineers to form an educational fund of not less than $3000 per annum, for five years certain. Subscriptions are to be pledged for this period, not to the Association, but to a Board of Trustees chosen in the first place by the Association. The appointment of Lecturer on Gas Manufacture would rest with the Trustees; and it is suggested that if the same man is elected to the office of Secretary of the Association, the combined position might prove of sufficient attraction to secure a really able technician. The expectation is also held out that the consolidation of duties thus shadowed forth might lead to the establishment of permanent headquarters for the Association, "where a reference library "could be collected, and where special efforts would be "made to keep on hand all data as to the engineering, "legal, commercial, and municipal branches of the busi-"ness." It will be interesting to watch the effect of this appeal, and, if it succeeds in the initial stages, to follow the course of the movement. At the risk of giving offence to some of our worthy friends "on the other side," we venture to express the hope that the gentleman who may be appointed to teach the young American gas idea how to shoot, will be a man after the heart of the true native leaders of the profession in all respects, and not least in the liking for writing and speaking plain English. Somehow, many American technicians and men of science with university credentials fall lamentably short of the standard of plain, simple speech which really well-educated men enjoying the high privilege of using the English language for their own observe all the world over. Thus we get a writer on gas subjects, with a handle to his name, discussing "the apparent *antithesis* (?) between the wrecking "and incendiary power of an explosion." What has the name of a figure of speech to do with gas explosions? Or why, when a newspaper reporter wishes to convey the information that a certain gas manager is doing his duty to the satisfaction of his company, should it be thought necessary to characterize him as the "bow anchor" of the undertaking, and his conduct as "keeping the . . . gas "vessel well abreast of the tide of the day"? This sort of writing is irritating and wearisome to read, and it comes of want of a word of warning in the early days.

Profit-Sharing and Co-Operation.

An interesting little discussion upon the mutual bearings of profit-sharing and co-operative production and dealing has sprung up after the National Co-operative Festival. Earl Grey, speaking at the festival, remarked that the great Wholesale Society had abandoned the principle of profit-sharing which was in vogue when it started; and he appealed to it to return to the earlier and better way. The present policy of the Wholesale Society is to restore all surplus profits to purchasers, for the reason that these are as a rule worse off than the Society's own well-paid staff. Lord Grey argues that by this exclusive regard for the purchaser, the Society deprives itself of the power of helping its employees to become co-partners, even as the South

Metropolitan Gas Company's servants are being elevated into shareholders. Lord Grey's arguments were flouted by a Mr. Ben Jones, who in turn was called to account by the veteran Mr. George Jacob Holyoake. It is a curious point. A well-argued contribution to the discussion, by Mr. George Henderson, has been published as a letter to the "Daily Chronicle." The writer asks, What is profit? And he finds the answer in the difference between the price paid for goods by the dealer and that which he receives for them. Out of this margin must come the charges for the dealers' capital, labour, and "leakage." Assuming the interest on capital and the wages of labour to be fixed, and the leakage to be amply covered, to whom does the balance of profit belong? "The co-operator's ideal is the interception of undue taxation in the distribution of goods. We have seen that, to be certain that just and equitable charges should be met without difficulty, a higher price than that paid for the goods was charged to the purchaser. If anything remains after discharging these claims, it is due to him that it be returned, and to each purchaser in the same proportion, as it would have been theirs if only the exact amount necessary for interest, labour, and leakage had in the first instance been put on as profit." From this point of view, a gas undertaking administered by a Scottish municipality is a true co-operative organization.

The Trades Union Congress Programme.

The Trades Union Congress at Bristol promises to furnish some curious matter for the newspapers to report and comment upon. The full programme of the proceedings has been approved and issued; and as this contains 86 resolutions to be submitted to the congress, the cast-iron rule which forbids the introduction of unauthorized subjects of discussion at the meetings will be justified. Year by year the process of eliminating the less reputable hangers-on to the cause of "Labour" from these congresses has progressed, until now it looks as if those who will speak in the name of Trade Unionism at Bristol are to be actual working men. Yet one could wish these suppositious "practical men" were more practical. The resolutions to be disposed of by this year's congress are for the most part only the warmed-up remainders of old controversies, of the merits of which working men know no more than the rest of the community. What, for instance, can the Trade Unionists tell the world concerning the taxation of ground values? Why should they trouble themselves with the question of forced labour in Bechuanaland, or with bi-metallism? Then, we notice that the Gas Workers' Union propose that any fresh revenue derived from the taxation of ground values should be ear-marked for the purposes of promoting technical education, extending free libraries, baths and washhouses, and the erection of artisans' dwellings. This is greatly to the credit of the gas workers, who may be supposed to be professionally conversant with the merits of the bath, while their abundant leisure enables them to make full use of public reading-rooms. It is stated that the gas workers also desire the amendment of the Workmen's Compensation Act, on the lines of a Bill drafted by Mr. Edward Browne, barrister-at-law. We are unhappily ignorant of the terms of this scheme of legislation, but would suggest that the working of the present Act might well be watched for a year or two before any further patching of the law is attempted in the interest of sections of workpeople. From the Trade Union standpoint, the most important question to be submitted to the congress is that of the federation of Trade Societies. A Committee was appointed at the last congress to inquire into and report upon this matter; and there are three schemes in the field for dealing with it. The policy of the Parliamentary Committee in regard to the engineers' strike is to be criticized. This should form a piquant item of the proceedings.

The Prizes of the Societe Technique.—The last number of "Le Gaz" contains particulars of the prizes offered by the above-named Society. The two most important are each of £400—one being for a new incandescent burner of marked superiority as compared with those now obtainable; and the other the reward for some distinct improvement in appliances employed in the manufacture or use of gas. Prizes to the total amount of £320 will also be awarded for the best papers on any subject of interest to the gas industry; and premiums of £10 will be given to the authors of the best papers read at this year's congress. The next annual meeting will be held in Paris in June, 1899.

WATER AND SANITARY AFFAIRS.

So-called "indignation meetings" and protests respecting the restriction of the East London water supply, may be very well disposed of by the remark of a morning contemporary that "the politics of the drought are rapidly developing." All the meetings and protests that agitators of the County Council school can possibly concoct, will not bring another drop of water into the Company's reservoirs, nor hasten the arrival of the rainy season. The distribution of storage jars, and the sending round of water-carts with free supplies, are good and practical measures. So also the visits of Sanitary Inspectors to see that a due amount of flushing is carried out. The distribution of disinfectants is likewise to be commended; and if there are to be any meetings, then such as take place between the Local Authorities, or other parties, and Mr. Bryan or the Directors of the Water Company, are likely to be of service. What help is to be obtained by an appeal to the Railway and Canal Commissioners, under the powers of Mr. Chaplin's Act, we are at a loss to conceive. No tribunal can compel the Company to supply water which does not exist. There seems to be an idea prevailing that the East London Company could get an enlarged supply if they would submit to have their dividends reduced by purchasing what is wanted from other Companies. There is thus an inveterate forgetfulness of the fact that, for the purposes of supply, there must not only be water but works. The East London Company are drawing water from the Thames at Sunbury; and there is plenty of water in the broad river. But the main through which the water has to flow will not transmit more than ten million gallons per day; neither is it legal for the Company to take more, except when the water is above flood-level, when of course the Conservators would be very willing to get rid of it, if the 36-inch main would take it. Recourse to the Kent Company simply results in getting as much as will flow through a couple of 4-inch mains in the Blackwall Tunnel. In the case of the New River Company, their contribution of 4 million gallons a day is readily obtainable through the medium of the River Lea. As for the other Companies, it taxes the wit of man to know how they are to render help, except by modes of communication which will be quite unavailable until the present crisis has passed away. Major-General Scott, of the Royal Engineers, who went over the ground last week in his capacity as the Official Water Examiner, must know if any engineering device can bring a further supply of water into East London; and if he has such knowledge, we should expect him to give the Company and the consumers the benefit of it.

At the meeting of the East London Directors on Thursday, it was unanimously resolved to "continue to purchase, as heretofore," all the water that could be spared by the New River Company, as well as any further supply that could be obtained from other Companies. This is action; and no clamour from outside, or pressure from the powers that be, can carry the matter further. There is, indeed, something more going on in the shape of distribution. The Company are putting up an enormous number of stand-pipes on the constantly-charged fire-mains; and these are found of immense service to the people. The Directors have also endorsed Mr. Bryan's promise to defray all the expenses incurred by the Local Authorities in assisting the people to obtain water and to store it. The effect of all this is that the population are receiving water at the rate of at least 26 gallons per head daily. How many towns and villages would be glad of such a supply! This is being accomplished—as shown in the admirable letter sent forth by Dr. Smee—with a rainfall nine inches short since last October, and while the water-level in the chalk is going down at the rate of about half an inch per day. Dr. Smee further shows that an East London "water famine" is equal to the normal supply of many towns and districts in England. But London has a County Council imbued with Progressive and Socialistic notions, and intent on persuading the inhabitants that the water supply will never be right until the Council supersedes the Water Companies. The dilemma of the East London Company—largely brought about by the Council itself—serves as a convenient basis for intensifying the agitation which is to sweep away all the Companies. If we only had a Parliament that was subservient to Spring Gardens, the question

of buying the Companies at County Council price would assuredly be "rushed;" the case of East London prompting the phrase "the time has now arrived." As it is, the utmost is being made of a restriction in the water supply which has been amply justified by the circumstance that all through last week the six hours flow was steadily maintained, and the peril of exhausting the reserve store has so far been averted, though it is to be feared the danger still exists. If only some further "restriction" could be brought to bear upon the waste of water which goes on in East London, there would be less occasion to "restrict" the supply; indeed, any such necessity might never arise. Even such a simple provision as the retention of house cisterns might have prevented the present distress, and such is the testimony of the correspondent of "The Times." As to the waste which is going on, the "Standard" describes much of it as "wanton and wicked," creating a necessity for a further limitation of the supply.

There is one point on which some explanation would seem to be most desirable. When receiving a deputation from the Hackney Vestry, Mr. Bryan is reported to have said that the River Lea was flowing at a lower level than had been known for years. Also, the experience of 1895-6 proved that all the experience of sixty years was not safe; the consequence being that the Company went to Parliament and got their Bill through last session. Of course, this signifies the session of 1897. Mr. Bryan, it is alleged, went on to say: "This experience will necessitate the "Company looking further afield to extend its works." If Mr. Bryan had said "further ahead," we could understand his words to mean further on in order of time. But the expression "further afield" seems to imply a fresh locality; and this is the meaning which appears to have been attached to Mr. Bryan's words by Mr. Whiter, who headed the deputation. This gentleman stated at a subsequent meeting of the Hackney Vestry, in reference to the East London works, that it was generally admitted the present sources of supply were pumped out; and that, even if the Company continued the supply, they would have to go "further afield for the water." We cannot imagine that this is the case, or that Mr. Bryan intended any such inference to be drawn from his words. The phrase "further afield" has got into men's mouths, and may be taken to mean going to Wales or anywhere else where water may be found.

The Local Government Board report on the typhoid epidemic which visited Maidstone in the autumn of 1897, was received by the authorities of the borough last Friday. The three Inspectors who were appointed as Commissioners to conduct the inquiry into the cause of the epidemic are unanimous and unhesitating in ascribing the outbreak to the pollution of the water supplied by the Maidstone Company from their Farleigh springs. Yet a determination of the exciting cause scarcely covers all the facts. Three contentions which were put forward by the Company at the time of the inquiry receive consideration and introduce some special features. One contention is that, although the bulk of the fever cases occurred within the areas supplied with Farleigh water, yet there were many in localities outside these areas; and that these cases must have been due to other causes than consumption of that particular supply. The Commissioners say that no evidence was given either for or against this hypothesis; and that it is therefore impossible to decide whether the persons so attacked had contracted the fever by casually drinking Farleigh water, or, as suggested by the Water Company, in other ways. The second contention is that 357 cases of typhoid fever were notified after Oct. 10; whereas all the Farleigh supply, except the Ewell and the Big Church springs, was cut off from Maidstone sixteen days before that date. Hence the Company argue that these 357 cases cannot reasonably be attributed to that supply. The Commissioners consider that this contention is "in the main a just one;" and they admit that nearly all the cases notified after Oct. 18 (some 280 in number) are to be regarded as having had a cause other than the consumption of Farleigh water. According to the report, this cause is to be sought in the existence of defective drains and sewers; and the consequent fouling of the soil by leakage. The third contention of the Water Company is described as "probably in some degree admissible;" and it elicits from the Commissioners an expression of opinion that "many of the cases of typhoid fever in the "borough of Maidstone were due to defects of drainage "and sewerage, with consequent pollution of the soil under-"lying the town."

It will thus be seen that the Farleigh water cannot be held entirely responsible for the disastrous epidemic under which Maidstone so signally suffered. The case is doubtless complicated by the consideration that infection from polluted soil and from defective drains was consequent on a previous reception of infective material; and the infection so set up could only have played a subordinate part in the earlier stages of the epidemic. One thing, however, seems to come out clearly—that the fever epidemic would never have assumed the dimensions it did, but for the insanitary conditions by which the town was characterized. The Commissioners charge the Town Council with having greatly neglected their duty in this respect, although the Medical Officer of Health had repeatedly warned them "in the plainest language" of the risks to which the health of the inhabitants was exposed by the insanitary conditions that were allowed to continue. The result of such neglect is indicated by the statement of the Commissioners, that the failure of duty in this respect on the part of the Town Council "led to the gravest consequences." Blame, therefore, does not seem to rest exclusively with the Water Company. The verdict of the Commissioners attributes the origin of the epidemic to the pollution of the Farleigh water; but the Town Council are evidently responsible for the extraordinary extent of the mischief which ensued.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 498.)

BUSINESS on the Stock Exchange last week was as quiet as it well could be; and it seemed as if the dead low-water mark of autumnal slackness had been reached. But in spite of this, the general tendency was decidedly favourable all round; and at any other time of the year, things would have been booming. As it was, some fairly good advances in price were made, although there was so little to stir them up; and hardly anything, except some rails which were out of favour, went back. There is no change or sign of change in the condition of the Money Market. The Bank rate is purely nominal; and "no reasonable offer refused" is nearer the correct quotation. In the Gas Market, business was just as quiet as in other departments. Occasionally it happens that from special causes Gas securities take a line of their own, apart from the ruling tendency in other markets; but the inactivity last week was universal. Movements in price were few in number, and slight in degree. They were also extremely irregular—moving in obedience to special influences; so that there was no general characteristic of the week. In Gaslights, very moderate business was done in the "A." The quotation was advanced a point; but the figures at which transactions were marked did not vary much all through the week. A few dealings in the secured issues seemed to indicate firmness, especially in debenture stocks. South Metropolitan was dealt in to a slight extent, and was fairly steady. Commercials effected only one or two transactions at middle figures. The Suburban and Provincial group exhibited their usual quiescence. Sheffield rose a couple of points, on the strength of the last accounts. British selling price went back a point. In Alliance and Dublin, the old stock which had been standing in advance of the new, fell back, while the new took its place in front. The Continental Companies were quiet and unchanged. Among the remoter undertakings, the only alteration was an advance in River Plate debenture. Dealings in Water were limited, and quite devoid of interest, except that East London receded a little through fear that measures rendered requisite to contend with the drought may prove costly.

The daily operations were: Business in Gas was of the lightest description on Monday; and quotations did not vary. There was a shade more animation on Tuesday; but it did not amount to much. Gaslight "A" improved 1; and River Plate debenture, 1; but British receded ½. On Wednesday, the volume of transactions fell back to its smallest proportions. Sheffield rose 2; and Alliance new, ½; but ditto old fell 1. In Water, East London receded 2. Business remained almost stagnant on Thursday; and no change took place in Gas. In Water, East London fell 1 more. Friday and Saturday may be summed up together as quiet and unchanged.

ELECTRIC LIGHTING MEMORANDA.

The Electric Lighting of Glasgow—Sound Electricity Supply Finance—More Alarms and Explosions.

THE development of the Glasgow Corporation electricity supply undertaking is worth watching by those who wish to know the truth about this class of business. The Glasgow Corporation

do not cherish any illusions respecting the place of electricity in the local resources. To hear the talk in some small towns, one would fancy that everything depended upon the answer given to the momentous question whether the local authority should undertake the supply of electricity, or leave it to a company. Glasgow has long passed this stage in the progress of municipalism. Whatever the city needs in the way of public service, is provided by the Corporation; and it is supplied at cost price. There is a "sweet simplicity" about this programme which commends it to the respectful admiration of those who hate the economical fallacy of "robbing Peter to pay Paul," which lingers in the affections of too many English municipalities. Glasgow does not go into the tramway business, or gas supply, or electric lighting in the supposed interest of the "ratepayers," as distinct from the whole body of the community. Neither does one Corporation Committee expect to be coddled by another, and its expenses covered up out of the public view. It is for this reason, among others, that Glasgow electric lighting is so interesting. There is plenty of money wherewith to carry on the business. Capital is not stinted where cause can be shown for laying it out; but every branch of municipal enterprise is expected to pay its way, or at least to stand upon its own bottom.

Glasgow has been supplying itself with electricity for six years, and yet finds a capital of considerably under £200,000 enough to employ in the undertaking. The capital expended at the end of the last municipal year, to be precise, was £188,034, upon which a gross revenue of £34,371 was received. The total working costs amounted to £16,900. The gross profit works out to 10·59 per cent. upon the capital, which is a very comfortable condition of affairs. After paying interest on loans, amounting to £4814, more than double this amount, or £10,482—being after the rate of 6·35 per cent. on the capital—was appropriated for sinking fund and depreciation. There is no other municipalized electricity supply undertaking that does anything like this. The majority of such undertakings listed in an electric lighting contemporary confess a deficit; and of those that show a profit only a handful make any provision at all for depreciation. Glasgow, at any rate, is not living in a Fool's Paradise, and does not mean to furnish a "frightful example" of municipal improvidence to a gaping universe. The Corporation will be all the more confident in embarking on the greater electrical ventures that lie before them in connection with tramway working, now that the technical and financial aspects of electricity supply for lighting purposes are so well known.

There has been a cessation of street-conduit explosions for so long that quite an air of novelty surrounds the incidents at Oldham and near the Regent's Park, where, as reported, coal gas and an electric spark again foregathered recently, with alarming results. The Oldham explosion was due to the unintentional combination of Corporation gas with Corporation electricity. Consequently very little fuss was made about it either in the electrical or general press. One of our electrical contemporaries, however, is very severe in its comments upon the conduct of the gas men (in the employ of The Gaslight and Coke Company) who had to do with the Regent's Park affair. The conduit in which this explosion occurred belongs to the St. Pancras Vestry. It blew off three heavy manhole covers, shattered several insulators, and displaced the copper strip over a distance of about 200 yards. "The cause of the explosion was undoubtedly an escape of gas from a faulty service-main, and its subsequent ignition; but how the latter actually took place is, as is usual in such cases, not absolutely certain." The fact of there being an escape of gas in the neighbourhood was discovered by a lamplighter; and men set to work to see to it. But they did not, report says, communicate the intelligence to the electric light generating station. It is suggested that the Gas Company's men were most likely still searching for the escape at midnight, "probably with lighted torches, as is their wont; and though the nearest manhole which was blown out was at a distance of some 70 yards from the gas escape . . . . there is a possibility of the gas having been ignited at one of the test-holes made by the men, and that the flame travelled along to the site of the explosion." Of course, it was all the gas and the Gas Company's men. "The insulators in the conduits appeared to have been in good condition, and bore no traces of sodium."

One seems to have heard a good deal at one time and another about these St. Pancras electricity conduits—not always to their advantage. The explosion on this occasion hurt the electricity-works more than anything or anybody else. "The short circuit resulting from the explosion pulled up one of the generating sets completely; and the pressure dropped to a very low value. One side of the three-wire system had to be shut down for about an hour and one half (*sic*), until the supply was cut off from the sections directly affected. No time was lost in reconnecting the houses on this section through temporary cables; and by Saturday evening every house was again supplied. Some of the feeders appear to have been seriously affected by the excess of current they had to carry momentarily. At 3.30 on Tuesday morning, another short-circuit occurred, of a less serious character." St. Pancras is one of those Local Authorities that do not see the necessity of making provision for the depreciation of their electric lighting plant. But some of their plant appears, from the circumstance above referred to, to be depreciating itself with inconvenient haste.

THE REPORT OF THE PETROLEUM COMMITTEE.

First Notice.

The report of the Select Committee on Petroleum has been issued; and, in view of the magnitude of the interests concerned directly or indirectly with the subject of this inquiry, we now propose to give an abstract of, and commentary on, the findings of the Committee. We shall treat the matter with regard to the paramount consideration of public safety, without much respect for the particular interests of the oil or lamp trades, but with due reference to the points of contact of the mineral oil and gas industries. Rarely has a Committee of Parliament been charged with a more difficult and thankless duty than this investigation; and there has hardly ever been a similar instance of so barefaced a capture of a body appointed to serve the public, and its misdirection to subserve the ends of a particular branch of a trade. The Committee were ordered to "inquire into and report upon the sufficiency of the law relating to the keeping, selling, using, and conveying of petroleum and other inflammable liquids, and the precautions to be adopted for the prevention of accidents with petroleum lamps." In the pursuance of their duty, the Committee held 53 sittings and examined 85 witnesses; they were present at various experiments made by certain of the witnesses; and they inspected a petroleum tank-steamer.

The sufficiency of the existing law relating to petroleum is the first point to be considered. There are Petroleum Acts dated 1871, 1879, and 1881. These Acts define petroleum, and set forth that the only kind of petroleum to which the restrictions of the law apply is that which gives off, when tested by the Abel close test, an inflammable vapour at less than 73° Fahr. (Act of 1879). The carriage of such statutory petroleum by ship is made subject to regulation by harbour authorities; but beyond this there is no provision in the Act as to the safe carrying of petroleum, except a power to local authorities to annex conditions to licences for storage, which conditions may include some as to the mode of carrying such petroleum within the district of the licensing authority. All statutory petroleum stores must be licensed, except when the aggregate quantity kept is less than 3 gallons, and when it is all kept in stoppered pint bottles. Hence all carburetting spirit required in gas-works comes under the law as to licensing; but not the store of pentane kept for photometrical purposes. Keepers of petroleum are not exempt from proceedings for nuisance. A desultory agitation for the amendment of the law relating to petroleum dates from 1883, which eventuated in the appointment of the present Committee.

The reference to the Committee divides itself naturally into the two heads of the *oil* and the *lamps*. By the existing law, petroleum is of two classes—petroleum flashing at 73° (Abel close test) and under; and petroleum with a higher flash-point. For the sake of simplicity, the Committee call the first division petroleum *spirit*, the second petroleum *oil*. The first thing that strikes one upon inquiring into the sufficiency of the law of petroleum in this country is the fact that the existing Acts only apply to petroleum spirit. Petroleum oil is subject to no statutory regulations whatever. This was a somewhat startling discovery for the Committee, who learnt that this country stands almost alone in this respect; other countries having regulations more or less stringent for the control of petroleum oil.

It is not singular for this land of comparative freedom to occupy an exceptional position such as is here indicated. The fact, however, seems to have impressed the Committee, who turn their attention first of all to the question whether the exemption of petroleum oil from control should continue. They admit that "many witnesses, some of them of great experience in the petroleum trade, have strongly contended that there is no need for legislation; that, after many years' trial, petroleum oil has been proved to be a safe article of commerce; and that demands for public safety are amply satisfied by the law as it stands." On the other hand, the official element, and representatives of the public authorities charged with the administration of the present law, have contended for "the absolute necessity of subjecting the storage, sale, and transport of petroleum oil to legislative control and legislation."

The chief support of this plea comes from the retail oil-shop. The retail trade in oil is often carred on in a careless manner, on premises altogether unsuited for the purpose. The occurrence of terrible fires, frequently resulting in loss of life, in these oil-shops has arrested public attention. The Committee received a mass of evidence which showed conclusively that petroleum oil, as distinct from petroleum spirit, was responsible for 30 per cent. of the petroleum accidents which have occurred in this country since the commencement of the trade. The Committee were placed in possession, by the late Sir Vivian Majendie, of full particulars of every accident; and they report that "in a large proportion of them, involving great loss of life and property, the petroleum was petroleum oil, and in some cases oil of a high flash. The evidence shows that when a fire is once established, the dangers do not differ to any appreciable extent, whatever may be the flash-point of the oil, and it further shows that a high-test petroleum cannot be relied on, so far as handling and storage are concerned, as a security against accidents." Thus two conclusions emerge: First, that some legislative regulation

of petroleum oil is necessary in the interest of public safety; secondly, that the flash-point of the oil is immaterial, so far as this necessity extends.

After carefully weighing the whole evidence brought before them, the Committee formed the opinion "that, in the interests of public safety, legislation is necessary for the control and regulation of petroleum oil as far as storage, transport, and sale are concerned," and that with regard to petroleum spirit also the present law is not adequate for the public safety, and should be amended. In order to carry out this recommendation, the Committee advise that the following provisions should now be made: "(1) To secure legislative control for petroleum generally, and admixtures of the same with other substances, certain heavy oils being exempted. (2) To adopt a flash-point—namely, 100°, Abel close test—as the dividing-line between petroleum oil and petroleum spirit. (3) To provide that, with the following exemptions, petroleum oil shall be kept only on premises registered or licensed under the Act, and petroleum spirit only on premises licensed under the Act." The exemptions are, spirit not exceeding 5 gallons; when oil and spirit are kept together, not exceeding 5 gallons of spirit and 40 gallons of oil; or 130 gallons of oil for private use only.

So far the report is all clear going. At this point, however, we begin to come upon debatable ground. Leaving for a moment the question of the alteration of the flash-point, let us consider the Committee's provision 4: "To provide that registered premises shall be at safe and suitable distances from protected works, such as dwelling-houses, churches, schools, or any such building or place as the local authority with whom the premises are registered may specify in a notice served upon the occupier of the premises, and required to be treated as a protected work; to limit the amount of oil (subject to the exemption in No. 3) on registered premises; generally to make regulations for registered premises." It is safe to say that legislation upon these lines, unless drafted with great care and knowledge, and administered with unusual circumspection, might prove extremely troublesome and hampering to many industries, including gas manufacture, which regularly or occasionally require large supplies of petroleum oil.

The other proposals in the report comprise the establishment of a system of licensing for the storage of petroleum spirit, and for the storage of petroleum oil in cases where it cannot be conveniently kept under registration; to regulate the keeping and use of petroleum for the purpose of motive power; to provide for an efficient systems of testing; for the prevention of oil overflows; and for the investigation of petroleum accidents. This finishes the part of the report relating to oil. On the second part of the inquiry—namely, the precautions to be adopted for the prevention of accidents with petroleum lamps, the Committee state that the evidence received has been upon two main points: (1) As to the flashing-point of petroleum to be used for illuminating purposes; (2) as to the prohibition of the keeping or exposing for sale lamps which are not made in accordance with a legalized standard of safety. This will be a convenient place to interrupt our story, as it will now enter upon a totally different branch of the subject.

THE WORK OF THE PATENT OFFICE.

Some curious reflections are aroused by the lately-issued report of the Comptroller of Patents, when read in conjunction with other recent illustrations of the working of the patent law. More than 30,000 applications for patents were filed last year; and if it is computed, as seems reasonable, that there are at least five persons occupied in "inventing something" to every one who goes the full length of applying for a patent, there is a vast crowd of people ceaselessly endeavouring to benefit their kind in this way. The number of applications has greatly increased of late years—a result which at the first glance seems to indicate that the Act of 1883 has encouraged people to take out patents. It was supposed that this would be the case, and that the reduction of the Patent Office fees, and the simplification of the procedure, would result in the patenting of a large crop of trivial or altogether worthless inventions. It is satisfactory to learn that this fear has not been justified. There might be a difficulty in determining the exact proportion of the increasing number of applications for patents rightly ascribable to the facilities of the new law; but it appears to be very fairly proved that the high quality of British inventiveness has not fallen off from the old standard. The only good test of the value of a patent to the holder is his behaviour in keeping it alive or letting it drop. The Comptroller reports that the actual number of patents continued for the full term is considerably larger than heretofore. This is eminently satisfactory. It appears from this fact and others that suggest themselves in the same connection, that the character of a people, as regards mechanical inventiveness, is but little affected by their national patent system. If, for example, the popular mind runs largely upon mechanical "notions," there will be a considerable number of patent applications, for inventions which will mostly prove to be worthless. It is highly desirable that where the patent system encourages the patenting of trifles, there should be some automatic arrangement for extinguishing the useless patents after a reasonable lapse of time. This is the case in the United Kingdom. It is not so in the United States; and for this reason the system of the latter country is to this extent defective as compared with the British plan.

The Comptroller again has occasion to draw attention to the occurrence of fashion in invention. At one period, as "The Times" puts it, "there is immense fertility with regard to new metallurgical devices and methods. At another time lamps and gas-burners engage the attention of scores of ingenious minds." The remarkable fact that one gas-burner patent has proved to be more fruitful than almost any other issued under the new system is not recognized. Yet what does the Patent Office owe to the Welsbach master-patent! It is certain that one such invention not only opens up a new field of enterprise and industry, but it also sends people off into all sorts of investigations which otherwise might have been left alone for years. This reflection brings us to the conclusion that the increased activity of the English Patent Office since 1883 is probably less caused by the "encouragement" offered to patentees by the new Act than by the example of successful invention in many fields. In that of gas lighting, there are the incandescent burner and acetylene. The inspiring influence of the many ideas associated with these things is deep, widespread, and persistent. The rush of inventors who have come under the attraction of these ideas has been unaffected by the consideration that incandescent gas-lighting is covered by a master-patent, while acetylene lighting is open. The salient feature of these and other fashions in invention is the indication they give of the truth that there is room for improvement even upon the best mechanical achievement. Why do so many ingenious and persevering persons continue hammering away at incandescent burners or acetylene generators? Simply because the very crowding of patentees into one field shows that nobody has yet attained perfection; and every new applicant fondly imagines he has made one step further towards it.

Certain pertinent questions are asked by the "The Times" respecting points of Patent Office experience not disclosed by the Comptroller's report. "Are there, practically speaking, as many separate applicants as applications? Or do the same persons, in the course of one or two years, file many different applications? From what classes do inventors mainly come? Are they chiefly mechanics? . . . . Do 'rank outsiders' often solve problems which have baffled the experts?" A little knowledge of the industrial world would have enabled the inquirer to answer these and other questions of the same order. When it is remembered that the born pioneers and leaders of industry—the Bessemers, Siemenses, and Maxims—take out hundreds of patents during their laborious lives, and this without regarding the "encouragement" offered by one national patent system as compared with another, it is obvious that the man of one patent application, although he may be most numerous, is really only the amateur of invention. The professional inventor knows full well that it is impossible for anybody to tell in advance what may be a meritorious invention; and, accordingly, having begun patenting he goes on. With regard to the classes from which inventions chiefly spring, it is certainly not the case that the majority of them are mechanics, strictly so called. Not even every invention is mechanical. The moment one leaves the mechanical and enters upon the chemical or electrical fields, the amateur gives place to the professional. It is hardly possible to conceive of a "rank outsider" as the true and first inventor of a new coal-tar derivative or an induction motor. Anybody, on the other hand, might be the inventor of a mouse-trap or a fly-catcher; but the ideas of what constitutes an "inventor," suggested by this comparison, differ widely for each case. A new chemical product, or a new motor, once formed or designed, remains for the world to use and for other inventors to reckon with. The other things are but toys.

The question as to whether outsiders "often solve problems which have baffled the experts" is a very familiar one. Stated in this precise form, however, it can be answered squarely in the negative. If varied to bring in the idea not of the solving of a recognized problem, but of striking out a new departure, the answer will be different. The first point to settle in regard to a question of this kind is, What is an "expert," and what an "outsider"? Not everybody who follows a particular calling is expert in his trade. On the other hand, a man who is an "outsider," in the sense of not being a tradesman, may yet, by his training in science, or even in clearness of thought, see more of what is wanted in a trade than those who are kept tied to the counter. Indeed, even an expert in a particular line of industry may be so engrossed with the thousand-and-one duties of every-day work as to confess his inability to conduct experimental research in directions which he may recognize as promising. It may be taken as true in the main, however, that the problems which have baffled the experts in an industry remain insoluble by mere uninstructed mother wit. An expert may have as much of this inestimable quality as the most uninstructed heaven-born genius of them all. We abide in the position of maintaining that where real experts are baffled—as, for example, in attaining the ideal in gas-engine design—the difficulty is likely to remain. It is a mistake for young inventors to assail these frowning citadels.

On the whole, the Comptroller's report conveys the impression that the British public are well served by the Patent Office. So far as the conduct of the officials is concerned, from the

Comptroller himself downwards, this is an opinion from which few reasonable persons who have had dealings with the Patent Office will dissent. Inventors, like poets, are an irritable genus; and not a few of the order are simply mad on the subject of their invention. The officials of the Patent Office, however, are courteous, patient, and painstaking; and they do a great deal of work for which they never get thanks, at a rate of remuneration which outside experts would scorn. The larger question of whether the English patent law is the best that could be made, in the interests of the public and the patentee, is not so easily disposed of. As already recorded in the "JOURNAL" (see *ante*, p. 197), the subject of granting compulsory licences under the Act has been dealt with by the Board of Trade not altogether unsatisfactorily; but it is complained that "the Board of Trade ought to see to it that an inquiry of eleven days and a large expenditure of money are not needed in order to give a manufacturer that which under a rational patent law ought to be given almost automatically." This is one point.

There is another matter in regard to which the system of Patent Office practice might, in the opinion of some competent critics, be improved. Mr. Charles D. Abel defends the English system generally, maintaining that "patents that have passed the severe ordeal of the German Patent Office are not one whit more secure than those granted under the liberal system of England," as tested by the upshot of subsequent litigation. There are "examiners" at the English Patent Office, as there are in Germany and the United States. According to a witty remark of Sir F. Bramwell, the chief merit of our own Patent Office examiners is that they do not examine. This is precisely what Mr. Abel would have them do, for the instruction (if he will receive it) of the intending patentee. In his opinion, "the only thing wanting in the English system is that the Patent Office should undertake the duty of finding out for the inventor whether or not his invention is new. After putting him in possession of this information (by pointing out to him the prior patents that may be supposed to more or less anticipate his invention), it should be left to him to decide whether he has an invention worth patenting." The suggestion is worth considering. Probably the Patent Office could fall in with it without any fresh legislation, if a grant to meet the necessary expense could be obtained from the Treasury.

OBITUARY.

Mr. GEORGE SOMERTON, the Chairman of the Portishead District Water-Works Company, died at Clifton Downs, on the 20th inst., aged 72.

The sad news reached London yesterday of the death, as the result of an Alpine accident, of Dr. JOHN HOPKINSON, the eminent electrician. The unfortunate gentleman was accompanied by his son and two daughters; and the entire party fell down a precipice.

The death is announced, at the age of 74, of Mr. DANIEL EVANS, who was some years since Manager of the Brymbo Water Company, and subsequently of the Rhos Gas and Ruabon Water Companies. He held the latter position for upwards of thirty years; retiring about three years ago upon a pension.

PERSONAL.

Mr. W. POVEY has been appointed Secretary of the Uttoxeter Gas Company.

Mr. J. SWARBRIGG has been entrusted with the management of the Cootehill (Co. Cavan) Gas-Works.

Mr. and Mrs. ANDREW WILSON, of Stewarton, Ayrshire, have just celebrated the sixtieth anniversary of their wedding-day. The marriage of the aged couple was solemnized at Kirkford in August, 1838; and, with the exception of six years spent in Airdrie, all their lives have been passed in the same place. Mr. Wilson came of an old and respected Stewarton family, who for generations were engaged in the manufacture of Scotch bonnets, for which the town has long been famous. He was born at Kirkford in the year 1812, and his wife, Annie M'Crae, sister of the late Mr. Boyd M. M'Crae, Manager for many years of the Dundee Gas-Works, and formerly Manager of the Airdrie Gas-Works, was born in the parish of Symington, in the Upper Ward of Lanarkshire, in the year 1818. Mr. Wilson continued in the bonnet trade till 1854, when he removed to Airdrie to become foreman of the gas-works there. In 1860, he was appointed to the management of the gas-works in his native town, in which capacity he acted till the year 1895, when he retired on a pension granted to him by the Directors of the Gas Company. Their family consisted of six sons and five daughters, five of whom still survive. The eldest son John is a schoolmaster under the Stranraer School Board; and the second is Mr. Thomas Wilson, Manager and Secretary of the Coatbridge Gas Company, who presided at the recent meeting of the North British Association of Gas Managers The youngest is in business in Kilmarnock. There are living 29 grandchildren, and one great-grandchild. As a proof that gas management "runs in the blood," it may be mentioned that there is a third generation represented by Mr. Andrew Wilson, at present the Gas Manager at Perth.

NOTES.

Locating Obstructions in Pipes by Sound.

A remarkable instance of the application of pure science to a strictly practical use is described in a paper by Mr. B. C. Batchellar, read before the Franklin Institute, on recent developments of pneumatic despatch-tubes. The particular subject of the application is not of much direct interest for readers of the "JOURNAL;" but the idea is noteworthy for its ingenuity and the successful issue of the trial. It appears that in a line of 8-inch pneumatic despatch-tubing, which was made of cast-iron water-mains specially bored out to the required dimension to take the "carrier," a settlement of the subsoil caused a break at which eventually a carrier lodged; thus blocking the whole of the tube. There were no means of knowing where the break was situated; and to excavate the entire distance between the stations would have been a troublesome and expensive business. In this emergency, Mr. Batchellar decided to try and locate the spot by the velocity of sound. The plan was to disconnect the terminal apparatus at one of the stations, fire a pistol into the tube, and note the time that elapsed between the discharge of the pistol and the return of the sound as an echo reflected back from the obstructing carrier. Then, knowing the velocity of sound, a simple calculation would give the distance from the station to the carrier. It is unnecessary to describe in detail the chronographic appliances devised for this experiment, which included a tuning-fork arranged to trace a wavy-line on a smoked drum. A mean of five determinations gave the time, and this was converted into a certain distance of travel, at which workmen were ordered to uncover and cut the pipe. "Before reaching the tube, air was heard escaping from the break, and the carrier was found almost exactly where it had been located by the instrument." This result must have been highly gratifying.

Uselessness of Cross Tubes in Boiler Furnaces.

A correspondent of the "Practical Engineer" calls attention to the comparative merits of two different systems of boiler inspection. By one system the inspector works from head-quarters, is liable to be sent all over the kingdom, and may not see the same boiler twice in a number of years. In the alternative system, every inspector has his own district, every boiler in which he gets to know, and also the men connected with it, so as to have by heart, in course of time, the history and vicissitudes of the boiler. The writer avows his preference for the latter system. It is remarked that inspection of a modern factory boiler is a far easier matter than the examination of one of the boilers of thirty years ago, set with low bottom flues and narrow side flues. The standard 8-feet Lancashire boiler of the present day, free of such useless encumbrances as cross tubes in the furnace flues, can be inspected almost without the inspector dirtying his clothes, if the sweep has done his duty. Probably inspectors are better aware than anyone else how useless the cross tubes in a boiler flue really are, and how very much freer of soot are the flues of a boiler which has no such cross tubes. The addition of the once highly-commended cross tubes means an extra charge of about £2 each to the cost of a boiler; and the money is worse than thrown away. The tubes are absolutely useless as an aid to water circulation, the connection of which phenomenon with that of steaming is doubtful anyway. They are most detrimental to good combustion, are a very serious hindrance to inspection and the sweep's work, and injure the draught. At the same time they are not a source of strength to the flue tube; and, in short, there is not a good word to be said for them on any account. Even granting that the cross tubes help to support a flue tube, they leave the furnace portion of it unstiffened; and it is here, and nowhere else, that extra strength is required, if at all. Thus they are "at most like so many ⅜-inch links in a ½-inch chain," and should be condemned once for all.

The Theory of Elastic Masonry Arches.

The availability of breeze and other light or cheap materials for making portland cement concrete at low cost in most localities has re-awakened engineering interest in the problems arising in the designing of masonry arches. It is a remarkable sign of the times that both upon the Continent and in this country, the fashion of iron and steel girder bridges and viaducts is yielding before the revival of the more durable and graceful masonry construction illustrated by the Monier and other concrete systems. Mr. D. A. Molitor has contributed a paper to the "Proceedings of the American Society of Civil Engineers" upon the modern theory of the elastic arch, and its application to masonry construction. This is a discovery which obviates the worst of the trouble of this kind of arch construction. The idea is stated to have been introduced by Köpcke, of Dresden, in 1880, by making a masonry arch with open joints at the crown and haunches. Few things in the whole range of engineering studies perplex the student more than the classical theory of the arch, as elaborated by Coulomb and his followers. There was always a considerable element of uncertainty in the demonstrations of the strength of arches based upon this theory, chiefly in connection with the location of the line of pressure at the abutment, and its variation under a moving load. The theory of the elastic arch has been fully tested upon full-sized examples by the Austrian Society of Engineers, and its reliability has been established. From these

trials, Mr. Molitor argues that all the harassing doubts in the matter of masonry arch design are overcome by the introduction of hinges at the crown and abutments; thus permitting a rigid analytical treatment, and affording almost absolute safety against cracks. Karl von Leibbrand, of Stuttgart, inserted cast-iron hinged bearings in a masonry arch built in 1893. The greatest triumph of this principle of bridge design is the Munderkingen arch over the Danube, of 50 metres span, with a rise of only one-tenth the span. This is a concrete bridge, by Leibbrand, and is rightly held to herald a new era of viaduct construction.

The Reported Synthesis of Albumen.

Publicity has been given to the claims ascribed to Dr. Leon Lilienfeld, of Vienna, for having prepared artificial albumen, of absolutely the same nourishing quality as that derived from organic life-processes. It was announced (as recorded in our "Editorial Notes," p. 299) that Dr. Lilienfeld had succeeded in preparing "pepton" from certain coal-tar derivatives; and from this the successful preparation of albumen was argued—somewhat inconclusively, as was suspected at the time. It now appears that the sensational report of Dr. Lilienfeld's triumph was at least premature. Experts looked in vain in the list of the raw materials of this synthesis for the sulphur, without which albumen, properly so called, does not exist in Nature. From the authentic report of the International Congress of Applied Chemistry, at which Dr. Lilienfeld's synthetical operation took place, it is to be gathered that what was prepared was "pepton" only. Whether this artificial pepton was really identical with the substance originally so called, which is a product of the digestion of albumen, is not proved to demonstration. And it is certain from the report that the pepton was not reconverted to its parent substance. No sooner had the newspaper report of Dr. Lilienfeld's doings appeared, than several English specialists published narrations of what had been previously accomplished in the same department of chemistry. From these accounts it is to be understood that Dr. J. W. Pickering and Professor Halliburton have actually carried the synthesis of proteids further than Professor Lilienfeld. These preparations answered to the reactions supposed to be characteristic of the natural products; but it was never claimed by their authors that the artificial substances in question were really proteids, only that they bore a striking resemblance to the real thing. Mr. Sidney Williamson, writing in "Nature," remarks that elementary analysis fails to indicate the essential characters of the proteids. "When, in addition, it is remembered how extremely complex and mobile the proteid molecule must of necessity be, and the readiness with which changes in its constitution are brought about, something more than a few empirical colour and physiological tests will be required to convince chemists that pepton has been actually synthesized."

Institution of Mining Engineers.—The ninth annual general meeting of this Institution will be held in the Mason Science College, Birmingham, on the 13th prox., under the presidency of Mr. A. M. Chambers. Among the papers to be submitted on the occasion will be one by Mr. Gilbert Little, of the New Conveyor Company, on "The Automatic Manipulation of Coal and Coke." A paper by Mr. J. Emerson Dowson on "Gas Power," and another by Dr. C. Kroseberg on "The Otto Coke-Oven," presented at previous meetings, are down for discussion.

The Protection of Water Supplies.—In the Chemistry and Meteorology Section of the Congress of the Royal Institute of Public Health, held last week in Dublin, Dr. John C. Thresh, Medical Officer of Health to the Essex County Council, and Lecturer on Public Health in the London Hospital Medical College, read a paper on "The Protection of Urban and Rural Water Supplies." In the course thereof, he said that year after year outbreaks of typhoid fever had occurred which had been traced to the use of polluted water; and in nearly every instance it had been shown that pollution could easily have been foreseen and prevented. He put forward the following suggestions as a basis for future legislation: (1) That sanitary authorities should have power to close any shallow well which could be proved to be liable to pollution; (2) that no shallow wells should be made until the site selected had been approved of by the Medical Officer of Health for the district; and (3) that sanitary authorities should be empowered to make bye-laws. He maintained that water companies should not be placed at the mercy of vindictive persons or a local authority who wished to cheapen the water-works with a view to ultimately purchasing them. Where water supplies were derived from rivers, the county council should be responsible for the condition of the stream, and should see that the pollution of it was reduced to a minimum. A resolution was passed to the effect that legislation is urgently needed for securing the supervision of all public water supplies. In the Municipal and Parliamentary Section, Dr. C. Porter, the Medical Officer of Health for Stockport, read a paper on "The Supervision by Sanitary Authorities of Public Water Services in the Hands of Private Companies;" and a resolution was passed expressing the hope that during next session the Government will introduce a Public Bill embodying the proposals submitted by Mr. Chaplin to the House of Commons last June.

COMMUNICATED ARTICLE.

OFFICIAL GAS TESTING.

By "VERITAS."

The conditions for the official examination of gas for public supply seem almost every year, at least in London, to be a fluctuating quantity. Many years back it was considered amply sufficient for the protection of the public to test the gas on a leading main at a distance of not less than 1000 yards from the seat of manufacture. At a later date, testing-stations were located at any place on any company's district, irrespective of fair sampling or free circulation.

In the rural districts, though power is given to the local authority to have the gas tested by an impartial scientific expert, the question is, I believe, optional, and not compulsory; and if not compulsory, the protection to the public is evaded, presumably on the ground of a saving in the rates—a pretext which is utterly fallacious. The amount which would have to be paid to a competent expert to examine the gas supply at intervals—the times of visitation being chosen by himself, of which the gas company were ignorant—must surely ensure a greater saving to the gas consumer as to his having good and pure gas, than the saving of neglecting this common-sense precaution by the local authority. However, we have to consider that it takes a large amount of coercion to knock common-sense into the head of the average vestryman, or (in modern language) the urban district council. The worst of all these bodies is that, in these times of democracy, the tendency is that the best educated classes, and those presumably having the best judicial discrimination, are a limited amount in proportion to their socialistic allies. The average local authority will spend any amount of public money on side issues, but neglect what (from their point of view a side issue) might effect a material saving to the ratepayers, if they had the clear brain power to regard things in their true light and with just views.

These are simply comments as to the action of ordinary local authorities, and the general administration of Acts of Parliament. In some cases, of course, tests can only be taken by due notice to the gas company of a definite period of, I believe, three hours; and in this event the testing is an absolute farce, as the company have ample time to prepare for the visit of the gas examiner, especially as the test has to be conducted on the works, and not at an independent and authenticated testing-station. In London proper, and in some of the suburbs, we have, it is true, a certain fixity of tenure, though there is much to be added that might be considered desirable. The London Gas Companies are, like urban districts, working under distinct definitions of respective Acts of Parliament; but the methods of testing under the authority of the London County Council have now developed into almost exaggerated condition. The Council are not satisfied with the *status in quo*. Their late Chemist did not consider that a proper check on the public gas supply was effected at the existing duly certificated official testing-stations; and there is not the slightest doubt that his opinion was corroborated by his (at least) semi-socialistic directors. The scheme of the so-called perambulating photometer was duly sanctioned, by which gas could be tested at any portion of a particular district, irrespective of its representing the average gas supply. This attempt at sneaking (I know no better English word to express my meaning) possibly inferior samples of gas, and publishing the results as a fair statement of the gas supplied to the whole of the district, has fortunately not become legalized, and one must hope that every person possessing an unbiassed mind will wish that such an event may never occur.

Whatever changes in public gas testing may take place in the future, at the present time there are mainly two elements to be considered with regard to London. In the first place, that the Gas Companies must comply with their respective Acts of Parliament; and, in the second place, that the methods of testing are absolutely under the control of a body of three gentlemen known as the Gas Referees. A further complication ensues in that the salary and conditions of work of the gas examiner is controlled to a large extent by the London County Council. We thus have a curious arrangement. The Companies have to make gas of a quality in compliance with their Special Acts. The quality is not a fixed quantity, but depends on conditions of testing. The Gas Referees prescribe all these conditions; and the County Council control the appointment or dismissal of the gas examiner, his salary, and what times he attends either for testing for illuminating power or for taking the pressure on the public lamps. Is not this what might be called (I hope without the slightest irreverence) a trinity of authority somewhat unnecessarily complicated?

The Gas Referees are a curiously constituted body. One of them is supposed to have a practical knowledge of gas manufacture. Many changes have happened of late years; and which of the three conforms at present to the prescribed conditions, I am unable to determine. Everybody knows that they take large salaries for comparatively trifling duties—not an uncommon circumstance in this world. They are supposed to periodically investigate the capacities of purification at the different gas-works. Have we any evidence that they have, for

many years past, exercised any practical energy in this direction? Their main idea seems to me to revolutionize photometrical methods, possibly what was in their minds conducing to scientific accuracy; all changes being to the disadvantage of the Gas Companies. They have modified photometers. They have also tried to modify the standard candle, but have landed themselves in an erroneous position—viz., that while they gave the most accurate definition of what a standard candle should be, they still certify the old Miller candle made on the old lines. Surely this attitude is inconsistent. If the Referees considered that the old Miller candle gave erroneous results, and that it was necessary to prescribe distinct and different methods of manufacture, why do they still officially certify the same candle which they previously condemned?

A minor matter is the modification as to the conducting of the official sulphur and ammonia tests, which must now be started and finished at certain hours. This may be a necessity of legal formality; but it certainly does not conduce to increased scientific accuracy, and the introduction of the aerorthometer in place of the usual correction for temperature and pressure by the well-known "tabular number," is totally unnecessary, except that it possibly gives a previously comparatively unknown scientific instrument an official recognition which would under other circumstances be absent. It is noteworthy that under the new regulations the accuracy of the aerorthometer has to be periodically checked; whereas no such provision is necessary with regard to the barometer and thermometer upon which the ordinary correction is founded.

The most extraordinary development with regard to official testing is of very recent date; and this is the introduction of a new pentane standard of light of an alleged 10-candle value, prescribed *absolutely* by the Referees as a legal standard. We have here a very radical change. On the institution of the Standards of Light Committee, it was the general opinion, not only of the public authorities but of the Gas Companies that no alteration could be made from the standard of sperm candles of six to the pound, burning at the rate of 120 grains per hour.

Now the Referees have suddenly and unexpectedly prescribed a new standard as a substitute for the candle. I take it that they founded their action on the presumption that, though any gas tested should be of a definite illuminating power of so many candles, an actual candle need not be employed in the testing. This new view is one which will undoubtedly have to be fought out to the bitter end, if necessary. Their action has two aspects: The first is that they have presumably the power of prescribing a new standard of light irrespective of appealing to Parliament; and the second involves a more important factor—that they can arbitrarily fix this upon the Gas Companies without consultation or consent.

The whole idea of the creation of a neutral body—namely, the Standards of Light Committee—was to prescribe a new standard of light subject to parliamentary sanction, with the acceptation of both parties that the standard candle gave erratic, and consequently unsatisfactory, results. If the Referees have the power of prescribing a new standard, why was this not done before? and why should all the expense have been incurred over the Standards of Light Committee, and the labour which was involved in complex investigations? The only explanation is that the Referees have suddenly discovered that they have powers of which they were previously in ignorance. Why such a presumably astute body should have had such a lapse of intelligence, is a matter beyond my powers of criticism.

One thing is definite—with the prescription of a new standard of light, the old candle standard will be wiped out; and the controversies as to its value will probably cease. This will be a comfort to many disputing parties. A standard which will give constant and reliable results must be universally acceptable. The only question is whether the new standard of an alleged 10-candle value is actually a multiple of the Miller candle at present in use. To employ a common expression, the "missing link," is whether the new method will afford the manufacturers of gas who have to do justice to the public interests as well as to their own, to preserve the *status quo*.

We have also to consider that the new standard has to be used in connection with the table photometer, in which the gas is burnt up to 16-candle value instead of (as under existing regulations) being rigidly confined to a consumption of 5 cubic feet per hour. This would give an advantage to the gas of less than 16-candle value on the old lines, and would therefore be a distinct gain to the Gas Companies, without apparently effecting any injury to the public.

The Sutton Gasholder and Tank.—In view of the interest evinced in the series of articles on the above subject recently communicated to the "JOURNAL" by Mr. F. S. Cripps, Assoc. M.Inst.C.E., they have, as notified in an advertisement which appears elsewhere, been reprinted, with the accompanying plates, in book form. In calling attention to these articles when they appeared, we omitted to state that the holder alluded to as the one to which the Sutton holder is similar in design, was the large one designed and carried out by Mr. Cripps in 1893 for the Bournemouth Gas and Water Company, to which Company he has acted as Consulting Engineer for the past eight or nine years; and to his designs all the extensions of the gas-works during that period have been executed.

TECHNICAL RECORD.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

Quarterly Meeting at Warrington.

The One-Hundred-and-Fifteenth Meeting of the Institution was held on Saturday, when the members—by invitation of the Gas Committee of the Corporation of Warrington, conveyed through the President (Mr. W. S. Haddock), who is their Gas Engineer—journeyed to Warrington for the purpose of inspecting the Longford Gas-Works. Considering the prospect of a wet day held forth by the threatening look of things early in the morning, there was a very fair number of members to be received by Mr. Haddock while partaking of the "light refreshments" thoughtfully provided directly on the party reaching the works. After this, an hour and more was occupied in a thorough examination of the plant designed, and to a large extent completed, by the Corporation's late Gas Engineer, Mr. James Paterson, and now being considerably modified and extended by Mr. Haddock.

A succinct account of the works as at present existing had been prepared by Mr. Haddock, and was in the hands of the members at the time of their visit. It appears that the works date from 1820; having been built in that year by Messrs. Barlow Bros., who had the management entirely in their hands until the cost of construction had been paid off. The town was first lighted with gas in 1821; and the price then charged for it was 15s. per 1000 cubic feet. The first record available as to the annual make of gas shows that in 1839—the price being then still as high as 15s. per 1000 cubic feet—the make was between 13 and 14 million cubic feet; and eight years later (in 1847, the year when the original Gas-Works Clauses Act was passed) the make had only increased by about 3 millions, though the price had been brought down to the then low rate of 4s. 6d. per 1000 cubic feet. The purchase of the works took place in 1877, by which time the make of gas had increased to 128 millions, and the price had been reduced to 3s. 3d.; while now the make is 282 millions and the price 2s. 10d. The original works were constructed on what was known as the Mersey Street site; and this was only given up last year as a manufacturing station. It had meanwhile been rebuilt several times; but in 1879, as it had become necessary to make further extensions, the Corporation were forced to select a new site. This was found at Longford; and 16 acres of land were purchased. A siding from the London and North-Western Railway Company was brought on to the land; and the coal-trucks are now run alongside the retort-house on an elevated railway—the coal sliding out of the trucks, by releasing the trap-doors, into the coal-store. At the present time, alterations are being made in the retort-house, which is 74 feet wide and 190 feet long. The retort-settings comprise two benches, each containing six beds of eight D retorts, 22 in. by 16 in. The settings are on the Klönne system, as modified by Mr. R. O. Paterson, of Cheltenham. They are capable of producing rather over 1½ million cubic feet of gas per day. The retort-house is arranged for West's manual stoking machinery; and each setting is provided with a separate hydraulic main, so that any one section can be closed off at will. It is intended to pull down the old retort-benches, and double the new arrangement. The condenser is vertical, consisting of four rows of 12-inch cast-iron pipes. Each row contains fourteen lengths of pipe, about 30 feet high. The exhausters are of Messrs. Donkin and Co.'s manufacture, and comprise two 40,000 cubic feet drums driven by a separate engine, and two 60,000 cubic feet drums and engine combined. The tar washer is by Messrs. C. & W. Walker, and is designed to remove the tar when passing 2 million cubic feet of gas per day. There are two scrubbers, each capable of purifying 500,000 cubic feet of gas per day. The tower scrubber is 90 ft. by 9 ft., and was made by Messrs. Ashmore, Benson, Pease, and Co. It is fitted with Green's patent screens and water distributor. At present, it is used for concentrating the weak liquor from the other washers. The washer-scrubbers are of the Kirkham, Hulett, and Chandler "Standard" and the Clapham "Eclipse" makes. The purification of the gas is finished in six boxes, 47 ft. 3 in. by 20 ft., made out of two 20-feet square boxes. As at present working, one box is arranged as a catch purifier. The material for charging the boxes is lifted by chain-elevators from the ground floor, and deposited into barrows in the boxes, and so spread over the grids. Each purifier has four 16-inch shoots, through which the foul material is discharged on to the ground floor. The covers are raised by a winch, driven by belting from a steam-engine. The station meter is one of Messrs. J. & J. Braddock's manufacture, and is capable of passing 70,000 cubic feet of gas per hour. The two holders are telescopic; and when filled they contain about 1½ million cubic feet of gas. There are also three small holders at Mersey Street, which contain ½ million cubic feet of gas when filled. They are supplied with gas from the Longford works; a special main and exhauster plant having been put down for this purpose. The gas is distributed from Longford through a 20-inch and a 16-inch governor, both of Messrs. Braddock's manufacture. At Mersey Street, there are two 12-inch governors and one 16-inch. The sulphate plant consists of one of Messrs. C. & W. Walker's continuous stills and heaters, capable of working up from 25 to 30 tons of liquor per day. The saturator is designed for a Wilton

discharger, by which all the salt is raised on to the draining-floor. The tar plant at the works consists of a primary still for working 10 tons of green tar. The vapours from the primary still pass through one of Ellison's patent heaters, by which the green tar is heated, and to a certain extent dehydrated. The cistern for storing the oils is arranged to act as the roof of the press-room and anthracene store. Much interest was evinced in the working of a Wells pneumatic painter in operation in the purifier-house.

The members soon after midday were driven to the Lion Hotel, and there entertained to lunch by the Gas Committee. The chair was occupied by Mr. Alderman Fairclough, J.P., the Deputy Mayor, and Chairman of the Gas Committee; the vice-chairs, by Mr. R. Heaton, the Deputy Chairman of the Gas Committee, and Mr. John Evans. At the conclusion of the luncheon a few toasts were proposed; and then Mr. W. R. Chester proposed, and Mr. R. G. Shadbolt seconded, a hearty vote of thanks to the Corporation Gas Committee for their hospitality during the day.

At 2.30 conveyances started to take the members and a few friends to Knutsford, *viâ* Arley—a magnificent drive, and one that would have been most enjoyable but that the miserable state of the weather compelled the use of closed coaches, which afforded anything but a pleasant means of locomotion on a warm August afternoon. Arriving at the George Hotel, Knutsford, tea was served; and then the merely formal business of the day was transacted.

The Hon. Secretary (Mr. S. S. Mellor) read the minutes of the previous meeting held at Morecambe, and the qualifications for membership of the two gentlemen applying for admission: Mr. James W. Wynne, of Ambleside, and Mr. Henry Froggatt, of Bollington. They were duly elected.

The party then broke up—part returning by train to Manchester, the rest by coach to Warrington—after a day the full enjoyment of which was only marred by the wet weather prevailing during what would otherwise have been the best part of the time the members were together.

PACIFIC COAST GAS ASSOCIATION.

Sixth Annual Meeting at San Francisco.

This Meeting was held on the 19th and 20th ult. The President, Mr. FRED. H. EICHBAUM, of San Francisco, occupied the chair; and there was a good attendance. The report of the Secretary and Treasurer was satisfactory, and showed that the list of members has now reached 112.

The report of the Committee on Standard Dimensions recommended the standard heaped bushel of 2747·7 cubic inches, as the unit of measurement for coke, lime, oxide, and all other dry materials (except coal) used in gas-works. Recognizing the difficulty of heaping to the standard cone, the Committee also recommended the use of a measure 14 inches in diameter and 17·8 inches deep, which would contain the bulk of a standard bushel by strike measure. The report was adopted after some discussion, in the course of which Mr. Jones stated that the standard bushel had been adopted by the American Gaslight Association, the Society of Gas Lighting, and the New England Association of Gas Engineers: and further that it was not proposed for buying and selling, but simply as a convenient unit for use when preparing papers, &c. Mr. Adams expressed a preference for weighing, instead of measuring; and he thought the pound avoirdupois answered every requirement.

The President, in the course of his Inaugural Address, said that the great need in their district was an increase of population, which for various reasons had not been so great as might be expected, looking at the salubrity and natural wealth of the district. Land was more difficult of acquirement than in other States; and they were a long way from the places where emigrants first touched the shores. He considered the immense discoveries of gold in Alaska, and the war with Spain, would have an important effect on the future of their district. Then there was the marvellous development of the Japanese Empire, the opening up of China, and the completion of the great Trans-Siberian Railway, which would probably force on the completion of the Nicaragua Canal. These events would lead to a rapid influx of population, not only in California, but in all the Pacific States. The enterprise directed to the utilization of water power in California might lead to the supply of electric current; but as regarded acetylene, its cost was prohibitive.

A discussion on the proposed amendments of the Association so as to include the generation, distribution, and consumption of electricity in the objects, and to render active officers of electric undertakings eligible for membership, was the next item on the agenda. Mr. Clements held that the proposed amendments were a mistake, and not in accordance with the concensus of opinion among the members. Gas and electricity were not kindred subjects, but rather in opposition; and, therefore, while he would be glad to support an electric association, he did not see how the two could be combined. When gas and electricity did fraternize, it was merely by force of circumstances; and as a general rule they were in active opposition to each other. The gas field was broad enough, as the experiences of the last five years showed; and they would not add anything to their glory by altering their sphere of operations. Mr. Crockett said there was no idea of changing the name of the Association. Many of the members were concerned with gas and electricity; both would be largely used in the district in the future; and there could be no more harm in discussing electricity than in discussing gas. But he was quite prepared to accept the result of a vote—and, indeed, would not vote against a majority. Mr. Jones said they already included electrical subjects in their *agenda;* and it was understood that electricians connected with the gas industry were not out of place in their roll of members. He thought, therefore, that no amendment was required. Mr. Burrows wished to keep the society entirely a Gas Association. While there was nothing to be gained by the proposed change, he could see that the result of its adoption might be very detrimental. Electricians were pushing men; and they might get control of the Association, and put gas in a very minor place. Mr. Clive agreed that the present rules were sufficiently wide, and that no enlargement was needed. After some further discussion, a vote was taken by roll call, with the result that the proposed amendments were unanimously rejected.

Mr. J. Clements, of Red Bluff (Cal.), read a paper on "Experiences," which dealt with matters of purely local interest.

Mr. A. Gutsch, Superintendent of the Fresno (Cal.) Gas and Electric Light Company, followed with a contribution on "Gas in Competition with Electricity by Water Power." He explained that his undertaking—already supplying gas, and electricity generated by steam power—was menaced by an opposition company started two years ago, to supply cheaper electricity by the aid of water power. His rates were 8s. 4d. per 1000 cubic feet for gas, and 7½d. to 15d. per unit for electricity by meter; and he at once inaugurated a liberal policy of supplying stoves, Welsbach gas-burners, and electrical fittings on hire. The new company adopted contract rates, ranging from ½d. to 1¼d. per 16-candle light per 24 hours, and 7s. 3d. per month for arc lamps. After six months, he shut down his electrical plant, and went on to gas entirely; thus saving a source of loss. He was now selling, at times, more gas than he sold before. The plant put down by the opposition company, though very costly, was not a success, and did not prove equal to the maximum demand; and the irregular voltage rendered the glow lamp far more delicate and costly than the Welsbach burner. The large capital called for a large interest; and they had to increase their prices, and also forbid the use of power during the maximum lighting hours. The Company could not, in fact, supply at prices that would compete with gas-engines and Welsbach burners.

Mr. Cardiff said that at Santa Cruz he bought electricity in bulk from a water-power company, who conveyed it some 18 miles. But gas was entirely replacing glow lamps, not merely because it was one-third the price, but owing to the fact that the electric current failed several times. Mr. Aldrich said that at Spokane there was an electrical plant driven by water power; but the Gas Company continued to exist and to prosper. The water power was right in the heart of the city; and no place enjoyed better facilities for supplying cheap electricity. He had 1300 consumers, and had increased the output of gas 100 per cent. in three years. Mr. Rice said that at Riverside he experienced the competition of a municipal water-power plant that had to transmit 27 miles. Their loss last year was about £1600; but he was doing remarkably well, having shown a record increase during the past year. A properly-conducted gas company could beat any electrical enterprise, municipal or otherwise.

A paper on "Lubrication" was read by Mr. O. M. Gregory, of San Jose, who pointed out the advantage of periodically painting all ironwork exposed to corrosive fumes—such as in the neighbourhood of seal-boxes or lutes—with petroleum. He recommended sight-feed lubricators for steam cylinders, and preferred lard oil to coal oil for the exhauster. He also preferred lard oil for coating the sides of the lids of purifier-boxes, as it did not contain so much volatile matter as petroleum. Valves should be attended to once a month; and it was not sufficient to merely apply the lubricant, but they should be opened and closed a sufficient number of times to ensure working the lubricant into every part.

(*To be continued.*)

The Kerbs Incandescent Gas-Burner.—Considerable interest is being manifested in Milan (writes a correspondent of the "Pall Mall Gazette") in the results of experiments made with a new type of incandescent gas-light which has been tested for street and internal lighting purposes. It is claimed that the new burner invented by Signor Kerbs, of Milan (described last week), effects an economy of 25 per cent. in the consumption of gas when compared with an Auer incandescent gas-lamp of the same illuminating power. This result has been confirmed by tests made by the Continental Union Gas Company at Milan, by the Auer Incandescent Gaslight Company of Rome, and by others; and the latter Company have already entered into a contract for the supply of the new type of burner. The economy realized in the consumption of gas is claimed to "be due to an improved method whereby the admixture of air with the gas is so regulated as to result in the complete combustion of the gas." Another advantage is that the durability of the mantle is said to be considerably prolonged—thus effecting still further economy to the consumer.

DR. STRACHE'S IMPROVEMENTS IN LIGHTING BY WATER GAS.

We referred briefly to the paper on "The Latest Advances in Lighting by Water Gas," which Dr. H. STRACHE, of Vienna, read before the recent meeting of the German Association of Gas and Water Engineers, in our report of the proceedings at that meeting (see *ante*, p. 201.) The paper contained, however, a large amount of matter of great interest technically, which we were unable to reproduce until after its publication in the official organ of the German Association—the "Journal für Gasbeleuchtung." In the following abstract-translation of Dr. Strache's last communication, we omit references to many facts recorded in earlier notices of his system in our pages.*

The aim of the recent improvements in the production and use of water gas has been to increase the yield of gas from the fuel. But at the same time an attempt has been made to employ coal or lignite in place of coke; while, for the sake of convenience and purity, the production of bye-products has been discontinued, and as far as may be all constituents of the fuel have been converted into water gas. The principles on which the generation of the water gas from coal takes place are substantially those set forth in Dr. Strache's specification, No. 3487 of 1895.† The generator is in the first instance charged with coke, which is raised to incandescence by an air-blast; and the resulting producer gas is consumed by means of a secondary air supply in a regenerating chamber, which is packed with fire-brick. The heat thus imparted to the fire-brick is utilized to superheat the steam which is blown through the chamber to the generator when the gas-making commences. Coal is added from time to time through an opening at the top of the generator. The superheated steam enters the generator near the same point, gasifies and carbonizes the layer of coal, and passes downwards with the gas and tarry products into the highly-heated coke in the lower part of the generator. The steam there forms water gas with the incandescent carbon, while the coal gas and tar are broken up into hydrogen and carbon. The carbon is deposited on the fuel; and the hydrogen passes away with the water gas. Ammonia is broken up into nitrogen and hydrogen. The processes which are carried out in this system of making water gas are three—viz.: (1) Gasification and carbonization of the coal; (2) decomposition of the products of distillation into carbon, hydrogen, and a small quantity of nitrogen; and (3) conversion of the coke formed by the carbonization of the coal into water gas.

The decomposition of the coal gas and tar yields a very large volume of hydrogen; thus one ton of coal produces 16,150 cubic feet of that gas. The coke—amounting to about 60 per cent. of the weight of the coal—drops down to the lower part of the generator, and serves for the production of water gas, of which the make per ton of coal varies from 10,765 to 43,060 cubic feet, according to the temperatures of the blast and the steam, and the radiation from, and the capacity of, the generator. The water gas consists of about equal volumes of hydrogen and carbonic oxide; and therefore a ton of coal yields in all from 26,915 to 59,210 cubic feet of a gas which is richer in hydrogen than ordinary water gas. The decomposition of the tar and ammonia is so complete that no trace of tar and no smell of ammonia can be detected in the water of the scrubbers through which the gas passes on leaving the generator. The water is, however, clouded by fine particles of soot resulting from the decomposition of hydrocarbons and carried forward by the gas.

It has long been recognized that superheating the steam leads to a great yield of water gas; but the superheating apparatus formerly tried had not a sufficiently great capacity to be of much value. The steam was, perhaps, raised about 100° C. in temperature; and complications in the working of the plant were introduced. The present apparatus admits of the steam being heated to 1000° to 1500° C.; and thus the generator is not so rapidly cooled by the admission of the steam as is ordinarily the case, and the "run" or period of gas-making may be greatly extended. It has also been recognized that superheating the air of the blast reduced the duration of the "blows," or periods of blasting, and diminished the consumption of fuel during that time. But a suitable apparatus for superheating the blast has not hitherto been constructed; and only in the present blast-heater, the structure of which cannot yet be made public, are the advantages of superheating the blast realized without undue complication of the apparatus. In a small apparatus even, the blast is heated 300° C., and the gaseous products of combustion from the regenerating chamber are reduced to 200° to 300° C. The following table shows the extent to which the consumption of fuel is diminished by superheating the air-blast and the steam. It refers to a generator nearly 2 feet in diameter internally, and a regenerating chamber 31½ inches in diameter internally; and a total radiation of heat amounting to 1010 calories per minute. The supply of primary air for the blast is taken at 353 cubic feet per minute; and the quantity of steam injected, at 2·2046 lbs. per minute.

*Pounds of Coke Consumed per 1000 Cubic Feet of Gas Made.**

Temperature of the Air-Blast in Degrees Centigrade.	Temperature of the Steam, in Degrees Centigrade.										
	0	100	200	300	400	500	600	800	1000	1200	1500
0	128·6	126·7	124·2	121·1	118·0	114·9	111·1	103·6	93·0	82·4	63·0
100	103·9	108·0	105·5	103·6	101·1	98·6	95·5	88·6	80·5	71·2	55·6
200	95·5	94·2	92·4	90·5	88·0	86·8	83·0	78·2	71·2	63·0	49·9
300	85·5	84·9	83·0	81·8	79·3	77·4	74·9	70·5	64·3	57·4	45·6
400	78·2	76·8	75·5	74·3	72·4	70·5	68·7	64·3	58·7	53·1	42·4
500	71·8	70·5	69·3	68·0	66·8	64·9	63·0	59·9	54·9	49·3	39·9
600	66·8	65·5	64·9	63·7	61·8	60·6	59·3	55·6	51·2	46·2	38·1
1000	53·7	53·1	52·4	51·2	49·9	49·3	48·1	45·6	42·4	38·7	33·1

* 62·4239 lbs. per 1000 cubic feet = 1 kilo. per cubic metre.

The consumption of coal in a small apparatus of 1766 cubic feet capacity amounted to 50 lbs. per 1000 cubic feet of gas made; but it is hoped that this consumption will be reduced to 31·2 lbs. in an apparatus having ten times the above capacity. The gain in economy experienced with increase in the size of apparatus arises from the fact that the radiation is relatively much less from the larger plant. The employment of a small relief gasholder, to receive the gas as it leaves the scrubbers and distribute it in a uniform stream to the purifiers and storage gasholder, is only necessary when the installation is large. With small installations the cost of a relief gasholder would be prohibitive; and the gas may in such cases be taken direct from the scrubbers to the purifiers. Or, the purifiers may be arranged posterior to the storage gasholder, so that the gas is purified as it leaves the holder for distribution to the places of consumption. The purifiers should be charged carefully, in order that silica carried in suspension by the gas may be removed from the latter. In early installations, deposits of silica frequently caused stoppages of services and burners.

The process for the removal of the gaseous iron compound from water gas by means of sulphuric acid has been so far perfected that 1600 cubic feet of gas are now purified by 1 lb. of acid. Another method (which cannot at present be described) of removing the iron impurity has been devised; but, when it is used, sulphuric acid or some other desiccating agent is also employed to dry the gas. The purified gas must not pass over unprotected iron surfaces, as it thereby is able to acquire the iron impurity afresh. New iron pipes for the distribution of water gas should therefore be tarred or galvanized; but old gas services do not injure the gas, as the iron is coated with a crust of oxide and sulphide which sufficiently protects the gas from contact with the iron. Mercaptan, which was formerly employed for giving an odour to the gas, has been discarded, because it was expensive and its smell was not sufficiently characteristic. In place of it, carbylamine is now used. Dr. Jahoda has devised a process for producing the substance in a concentrated condition (50 per cent. strength) at a cheap rate; and an odour may therefore be imparted to the gas at a very low cost.

(To be continued.)

* See "JOURNAL," Vol. LXIII., pp. 527, 568; Vol. LXV., p. 218; Vol. LXVII., p. 1217; Vol. LXIX., p. 24; and Vol. LXX., p. 897.

† *Ibid.*, Vol. LXVII., p. 567.

TEST OF A PIPE DISTRIBUTION SYSTEM.

The Annual Meeting of the American Water-Works Association was held a short time since at Denver (Col.). One of the papers prepared for the occasion, but not presented, was by Mr. J. S. HARING; and the author gave therein a description of an important test of a pipe distribution system recently carried out under his supervision. The following particulars are taken from the "Engineering Record."

In 1896 a new system of pipes, ranging in size from 12 to 4 inches, and in length about 10½ miles, was constructed. At the time the contracts were made, several open questions as to the choice of the source of supply caused delay in coming to a decision as to where it should be taken from—it was, indeed, months after the work was done before a conclusion was arrived at. The work of laying the pipes began in May and was completed in the following December. At the time the work was progressing, provision was made for placing hydrants; but they were not then contracted for, and their T connections were closed by temporary plugs, as were also some dead ends.

The pipe contract was awarded to one of the most reliable pipe companies. The specifications were the usual provisions for a test of 300 lbs. hydraulic pressure per square inch, the pipe to be sharply rapped with a hammer while under such pressure. No inspector was placed at the foundry; the pipe being taken under the company's guarantee. An inspector examined the pipe while it was being unloaded, and he again went over the pipe while it was hauled to its position in the street. Finally it was inspected by the contractor's men when being laid. The inspector selected for this work was a practical foundryman, who was thoroughly familiar with foundrypractice and cast metals; and in order that he might more fully familiarize himself with this pipe, Mr. Haring and he visited the foundry and examined the method of manufacture. The same course was pursued with regard to the manufacture of the valves; each being tested at the factory to 300 lbs. internal pressure. This method proved

to be of advantage to both the city and the manufacturers, as they were able later on to discuss defects which were found with far greater intelligence than if no positive knowledge of the methods of manufacture had been had. The inspector's examination of the valves covered everything in connection with them, and particularly the setting up tight of the dome and packing-gland nuts. About 175 valves were used in the mains, and 70 in setting hydrants as supplemental valves. Nearly the whole of the valves for the mains were delivered in May; the hydrant valves in October. They were inspected and stored in a warehouse until used.

In March, 1897, a contract for setting the hydrants was made, and the work thereunder began in April, and was completed in June. During the whole time between the beginning of pipe laying and the completion of setting the hydrants, no test of the distribution system could be made. Immediately following the setting of the hydrants, all temporary plugs were removed and solid permanent plugs put in, so that a test of the system could be carried out. The contracts for laying the pipe and setting the hydrants had specified that a test of 200 lbs. per square inch should be made. The territory covered was that of a hillside, ranging in elevation from 0 to 250 feet; the reservoir being at an elevation of 352 feet. A temporary connection was made between the main leading from the reservoir and the system tested, by means of a 2½-inch fire-hose connected with a hydrant nozzle.

The test was under the charge of a foreman who had been an inspector on the pipe laying and hydrant setting—a man of more than ordinary intelligence, carefulness, and honesty in the performance of his work. The pipes were filled with great care. About two weeks were taken to accomplish this, so that no "hammer" or compressed air would occur. Each hydrant was opened and left open to allow the escape of air as it was found the water was rising to near its level, until it ran out at the hydrant. Blow-offs were opened, and all dirt and accumulations taken out of the pipes until those in charge were satisfied that every precaution had been taken to make a proper test.

The means of testing were those usually employed—a boiler feed-pump set in a galvanized sheet-iron 10-gallon can, bolted through the bottom to a plank; the pump being connected with an inch galvanized iron pipe and valve by a union to a special hydrant nozzle cap. Water was supplied to the can from a barrel filled from the hydrant before connecting the pump. Attached to the other hydrant nozzle was a test-gauge registering up to 200 lbs. pressure. This was afterwards changed to a gauge registering up to 400 lbs., for the peculiar reason that the contractor who set the hydrants claimed that the engineers were going over 200 lbs. in their test, and were thereby causing the various leaks which appeared in his work, and were violating the terms of his contract by excessive pressure. The sensitiveness of this gauge was not very great, and caused some annoyance in use.

The test was begun at the bottom in small sections, and from this proceeded slowly over the whole system. There being no service connections, the work was very much simplified. First the reservoir test was made by shutting off all supply. The pressure was noted for a few minutes, when the pump would be applied and a pressure maintained by closing the globe valve from the pump. As all defects were sought for and corrected in each section as found, the work of testing was slow; and Mr. Haring, who began the test personally, soon found that, other duties pressing upon him, he had to delegate the matter generally to his foreman.

By the liberal use of valves in the system, the ability to cut off small sections and to locate defective valves (generally from some obstructions under the disc) was very interesting. At the beginning, considerable trouble was experienced on one section. The action of the gauge convinced Mr. Haring that it was not a leak, but must be a defective valve. After manipulating numerous valves, he located the trouble at one immediately on the corner where the test was being made. After digging up the valve and taking off the dome, fully 1 lb. of gravel, sand, and a part of a tin can were found in it.

As a charge was to be made against the various contractors doing the work of furnishing materials, each was notified of the test to be made and the date when it would begin. Only the contractor who set the hydrants—a local man—responded. The test demonstrated only nine minor defects in pipe laying, the cost of repairing which amounted to $89·39. But the pipe demonstrated the peculiarities of the situation, and it in turn was surpassed by the defects found in the valves. Three breaks occurred in the 12-inch pipe, two in the 8-inch pipe, and two in the 6-inch pipe, the cost to repair which amounted to $237·49. The fracture in this pipe was, in every instance, shown by the pipe to be due to inherent foundry defects, "cold shorts," honeycomb shrinkage, and foundry imperfections.

After the foundry test, the care of inspection, and every precaution, why should these pipes fail under a 200-lb. pressure test? Naturally the pipe company demurred to the charges made against them, and argued from their foundry test that such results were impossible; but that they actually occurred cannot be disputed.

Mr. Haring required in the valves supplied for the mains the use of sheet rubber gaskets; but in the hydrant valves this provision was not made, and the ordinary oiled paper was used for gaskets. Of the 175 valves employed in the mains, 19 were found to be leaking around the packing-gland gasket. Of the 67 hydrant valves then placed, 13 gaskets were defective; the total cost of making good the defects being $152·33. The engineers claimed that the general cause of the leaks was that the gaskets were too thin, the iron surfaces were compressed together without sufficient elastic material to shut off fully the space between their faces, and in two instances the follower of the packing gland was too large to enter the casting.

The valve manufacturers made a careful examination of the claims, and disputed their liability for the damage. They claimed, in the first place, that the engineers had not properly conducted the test, having compressed air in the system which had found its way out through the gaskets of the valves as the points of least resistance. Secondly, that if the air had not been compressed in the system, it had been in the domes of the valves, thereby causing the gaskets to blow out, and that the air pressure would amount, under such conditions, to more than 200 lbs. Thirdly, it was claimed that if the packing-gland nuts were tightened up when they were inspected in May, 1896, the gaskets had shrunk, and the nuts again needed tightening.

When the gaskets were produced, in each case marked as to locality, and none of them showed the least signs of having been blown out, no explanation made by them seemed to account for the cause. That the leaks were very large from this cause was demonstrated at the personal examination of a representative of the company who happened to be present when one of the leaks made itself evident. It is claimed by the makers of these valves that no similar experience had ever come to them in a matter of this kind. Of the many thousands of valves sent out by them, none had ever been found defective in the two ways discovered in this case. They claim that, with their shop practice and system of testing valves, no such defects could be afterwards found; yet they were, and they are indisputable.

TARRED MACADAM FOR ROAD MAKING.

At the Annual Meeting of the Association of Municipal and County Engineers recently held in Edinburgh, Mr. A. H. Campbell, the City Surveyor of Canterbury, read the following paper as to the use of tarred macadam in the construction of roadways in urban districts:—

The Committee of the last International Congress of Hygiene and Demography, held at Buda-Pesth, adopted the following resolution: "That the paving of streets should be smooth, and as far as practicable impervious, to facilitate cleansing, and also to prevent contamination of the subsoil." The text of the resolution comprehends in a sentence all the essentials of a good roadway. These may be briefly summarized under the following heads: (*a*) Durability, (*b*) the minimum of noise, and (*c*) the minimum of first cost, consistent with the foregoing.

The attainment of the first of these essentials is best realized by the adoption of granite setts, as may be witnessed more or less in all large cities, and nowhere to a greater proportionate extent than in the city where the Association are now assembled. This kind of paving, however, is not smooth. It is most noisy; the truism of "empty vehicles (not vessels) making the most sound," receiving abundant illustration on this form of road. And, further, unless laid on a bed of concrete and jointed in pitch, it is not impervious, and the facility of cleansing is much impeded, due to the numerous joints wearing open and rounding off, holding the dirt and dust of roadways. It is, moreover, costly—probably nearly as costly in construction as wood pavement; and its only claim for use is its durability. Allied to this material for road formation is the use of blue brick setts for carriage-ways, which are having experimental trials in a few places.

The attainment of the second head—*i.e.*, minimum of noise—is best realized by one or other of these descriptions of materials: (1) Gutta-percha, (2) compressed asphalte and concrete macadam, (3) wood paving, and (4) macadam.

The first named is mentioned only as the ideal of noiselessness, and not as entering into comparison with any of the well-known materials of road construction. It is in a very experimental stage as yet, and has hardly come within the scope of practical consideration. It is to be seen in small short sections in Glasgow, and at the entrance to Euston Station, London.

Compressed asphalte, also concrete macadam, is clean, impervious, and durable; and, saving for the clatter of horses' feet, it may be described as comparatively noiseless. Involving, as asphalte does, the underlying bed of concrete, the first cost renders it prohibitory in all save large centres of population. It is, moreover, slippery, and unsuited to inclined roads upon a hill.

Wood paving comes next in the fulfilment of the necessary conditions of the text. It is smooth; is probably the least noisy of any of the descriptions of hard pavement; it is of moderate durability; and, if of the hard wood description, practically impervious to moisture. Its first cost, however, and the unreasonably short periods allowed for repayment, render the general adoption of wood pavement in moderate-sized towns, or even in the suburban parts of large cities, very unlikely, if not prohibitory. The class of town or urban district to which allusion is made, is that of moderate size and limited financial resource,

which are restricted therefore to the use of macadam in the construction of their highways.

As it is from moderate-sized towns or districts that so many members of the Association come, the consideration of any improved form of macadam paving acquires special interest and importance; and there is no improved form which is coming so much to the front, and demanding that attention which its merits unquestionably deserve, as that now known by the name of "tarred macadam"—that is, a composition of any of the stones, gravel, or clinkers commonly used in the making of macadam roads with a mixture of tar. It appears a composition simple enough; but its preparation and laying, so as to turn out a success, bristle with delicate detail. When properly made, and on roads suited for it, this construction of road complies most nearly—compressed asphalte perhaps excepted—with the conditions laid down in the resolution set forth at the outset of this paper. It is a smooth and noiseless road, it is non-absorbent, it is cleanly in itself and easily kept clean, and its first cost is within the capacity of the most reasonably restricted finance of small towns and districts.

With all the advantages enumerated, it appears remarkable that tarred macadam has not yet been adopted except on the most limited scale. It is true that tarred gravel or limestone footpaths have been in use for a great number of years, and have now obtained a deservedly wide adoption; but the extension of this same composition, only of a larger gauge metal, to the construction of roadways has been most limited. As accounting for this, these reasons may be suggested: The failures which frequently attend a first trial; uncertainty as to the properties and action of tar, and how it will unite with the aggregate which it is designed to incorporate. The author can speak from personal experience of its failure and of its success too—failure where success was expected, and success where failure might be anticipated; and this is evidence of the fickle character of the composition. In its preparation, storage, and laying the author has had special opportunity for its study; the composition, as used by him, being prepared by the workmen in his department.

There is here submitted in tabular form an epitome of particulars of several streets laid by the author during the past three years:—

Name of Street.	Width of Carriage-way.	Nature of Traffic.	Date when laid.	Thickness, Aggregate.	Cost per Superficial Yard.
	ft. in.				
1.—Stour Street	8 2	Heavy continuous traffic, three traction trains passing daily	July, 1895.	6 inches of Kentish rag	About 4s. 6d.
2.—Turnagain Lane (cul-de-sac) . . .	8 2	Light van traffic . .	Nov., 1895.	4 inches of gravel on the old natural road formation	3s. 0d.
3.—Orange St. .	17 0	Medium through traffic, carriers' waggons, carts, and tradesmen's vans .	March, 1897.	4 inches of gravel underlaid by 3 inches of hard broken brick	4s. 6d.
4.—King Street	(1) 16 6 (2) 8 2	Ditto. . .	May, 1897.	3 inches ditto	About 4s. 0d.
5.—Guildhall St.	15 9	Heavy through traffic, omnibuses, and general town traffic . .	Sept., 1897.	4 inches ditto	4s. 6d.

Experience.—1. Failure. Quite unable to support the constant action of the traction-engine traffic. 2. Satisfactory. 3. Most satisfactory. 4. Moderately satisfactory. Centre of way along horse track commenced to disintegrate, due to the tar being overboiled, and the material hardening or setting before using. 5. Generally satisfactory. Superficially softens on parts in sun heat, but otherwise is doing well.

Besides the foregoing list, a number of lanes in Canterbury have been partially laid with this composition; and at the present time St. Margaret Street, about 700 feet long, with a carriage-way of only 12 feet, and in the centre of the city, having heavy vehicular traffic, is in process of laying.

The preparation and laying embrace these details: (1) The nature of the aggregate and its preparation. (2) The tar, its nature and treatment. (3) The mixing of these two together. (4) The storage. (5) The laying down upon the road. (6) The cost.

As regards the nature or description of the aggregate, the author has tried Kentish rag-stone, surface picked flints, pit gravel, and Guernsey granite. The stone is prepared for the tar by burning in the open. It is laid out first of all in a flat bed about 12 inches thick, and of rectangular plan. On this is spread a layer of coke and breeze about 3 to 4 inches thick, with a little wood to assist the fire; this is then overlaid so as to form a stack of stone about 5 feet in height from the ground. In the meantime, as the last addition to the height is made, the fire of wood and coke has been kindled, and it is allowed to penetrate the stack. About 1½ chaldrons (54 bushels) of coke are consumed in a stack of 60 cubic yards. As regards the length and size of the stack of stone, this may be made endless by laying out the stack so as to describe a circle; thus following, in the process of mixing, a circular course, with certain obvious advantages. Other makers of tarred stone composition in the author's district arrange the stack in the form of a cone, close it up at the top, fire it in the centre, and, allowing the fire to penetrate the mass, leave the stack of stone untouched while this process of firing proceeds. This operation may take any time between seven and ten days. The stack is then opened up, and the hot stone applied to the prepared tar.

In either of these methods of firing the stone, a great deal of loss by disintegration occurs; the stone succumbing to the influence of the fire, and tending to get reduced to a coarse-grained powder. Particularly so was this the case with a trial of granite exposed to fire, which quickly produced the condition above described. For this reason the author would much prefer the heating of the stone in an oven or kiln. The temperature would be more equable; and the severe firing causing the disintegration described would be avoided. On the subject of "heating," one or two remarks may be submitted. The author believes it to be the practice with some makers not to heat the stone at all, but, being sure that the stone is dry and free from moisture, apply it in the cold, but thoroughly dry, state to the prepared tar. This condition of the stone, in the author's opinion, resembles the risk attached to laying the tarred mixture in position in cold instead of hot weather. The tar refuses to "work," the temperatures being so unequal; and when the sun (particularly that of the sunny South) beats upon such a road, it is not improbable that this defect will discover itself in the liquefied tar bubbling and spewing itself up over the surface.

The temperature of the stone when the tar is applied should be such as the palm of the hand can bear with comfort. If too hot, the tar will be destroyed as a cohesive; if too cold, the tar will go on too thickly, and under the rays of a hot sun will soften. The hot stone, when ready to be mixed with the prepared tar, is sifted through two gauges graduated to 1 and to ½ inch, giving three sizes of material—1 to 2 inch gauge for the body material, ½ inch to 1 inch gauge for the intermediate or fining coat, and ¼ inch to ½ inch gauge for the skin or top dressing. These three sizes are placed in layers as follows: 3 to 4 inches thick of the coarse, about ¾ inch thick of the intermediate, and the top dressing in the thinnest layer possible, with a view only to filling all interstices. Thereafter a dressing of fine ¼ inch granite or limestone siftings is scattered broadcast, and the traffic at once allowed on the road; working this top dressing in, and assisting in the consolidation of the road formation. The weight of the roller employed by the author is nominally 10 tons; and each of the three layers is rolled separately.

Considerable importance is attached to the state of the weather at the time of laying. It should be done in the sun by preference, and to assure a good result. If laid in a cold temperature, and with any defects present in the composition, disappointment and possible failure will result. The weather being normal, any time between May and September (inclusive) may be regarded as suitable. One word as to wet weather. Operations, both of mixing and of laying, should be suspended in time of "wet," where they are conducted in the open, as nothing so corrupts the composition as the presence of moisture.

In constructing a road of this tarred composition, the old surface is removed to a depth of 8 inches, and re-made with a 4-inch thickness of dry hard broken stone, furnace clinker, or brick. This is rolled smooth, and finished to the required camber of the road. The author's reasons for this underlying ballasting of dry material are twofold: (1) To separate the tarred composition from any damp substratum; and (2) to economize in the thickness of tarred material. In the author's practice, the tarred composition is only 4 inches thick (finished). This by itself would be an insufficient surface formation to bear the traffic and resist the damp; but underlaid by the dry ballasting of hard material, well rolled, and preferably grouted with cement or brushed with well-boiled tar, it appears to answer the requirements for which it is introduced.

One sentence is necessary as to having the tarred mixture all in a fresh or "live" state when being laid, otherwise cracking and disintegration of the road will rapidly occur; also as to keeping off all traffic during the progress of the work—not because the traffic in itself is an injury, but because of the dirt, dust, and other matter foreign to the mixture being imported, and destroying the binding together of the layers in one corporate mass. This hint is one to which the author attaches considerable importance, as the effects of this occurrence have been painfully present to his sight upon portions of two roads which he has laid down.

The quality of the tar employed is no less important than the other details of the work. Some trading firms making this material use the refined or distilled tar, and excellent results are thus obtainable; but more commonly it is the ordinary gas tar that is employed at a cost of about 2d. per gallon. This tar should, as far as possible, be free from water, and of a stiff dense consistency, any defects of this character having to be counteracted in the boiling operation. The lighter the tar, the longer it must boil, so that all light oils are driven off. To each 50 gallons of tar is added a small proportion of pitch (about

half a bucketful), and these are boiled together. The author would not assert the necessity of introducing even this small proportion of pitch. But the cost of doing so is almost infinitesimal; and as a counteractive to bad quality of tar it is good, and worth introducing.

The life of this description of road paving may be taken at seven years. So that, divided over that term, the annual cost of a road so paved will work out at 7·7d. per super yard. During this term, it may become necessary to lay out certain small amounts in repairs, so as to maintain the surface smooth, whole, and impervious. This, estimated at 2d. per yard per annum, will give a grand total of 9·7d. per super yard per annum for this description of roadway. This rate for a good street pavement in urban districts, for heavy vehicular traffic of the ordinary sort (that is, including traction engine traffic, for which it is unsuited), is most moderate. Compared with any of the other descriptions of paving, even with ordinary macadam, it is rather less; and side by side with any of the improved harder pavements—wood, compressed asphalte, or setts on concrete bed—it is incomparably less costly. The author does not, however, suggest that this description of pavement should enter into competition with these superior materials of road construction. Each and all of them—stone setts, wood, asphalte, tarred macadam, and ordinary macadam—have their respective places. All, save tar macadam, have had their field and play; and it is for a fair field, devoid of any favour, that the author presents to the Association a plea on behalf of tar macadam. On the leading streets of smaller provincial towns, in the secondary and suburban thoroughfares of large towns, where in many cases stone or granite setts are used, of heavy cost, tarred macadam, properly prepared and laid, would form a welcome, valuable, and economic substitute.

In the discussion on the paper, Mr. Smith Savile, of Darwen, said he had always been accustomed to mixing the tar with cold macadam, instead of heating the stone in the way adopted by Mr. Campbell. Mr. Wike, of Sheffield, said he had had comparisons made of the cost of granite and tar macadam, and found the former was 50 per cent. cheaper than the latter. Mr. Baker, of Middlesbrough, said he believed the most important matter in connection with the use of tar macadam was the proper boiling of the tar, so as to get it of the same consistency. It was also important, in the making of the road, to get a good sound foundation under the tar macadam. He did not consider the burning of the stone to be necessary, providing it was thoroughly dry and the tar properly boiled. Mr. Lemon, of Southampton, remarked that there was nothing particularly new about tar macadam. He had seen it in a number of towns, and had noticed a good many failures. He considered it best to convert old macadamized roads into tar macadam roads, rather than start with the latter material on an entirely new road, so as to avoid the very heavy cost for foundations referred to by Mr. Campbell. If this plan were adopted, they could get a good tar macadam road for 3s. per yard super. He, however, advised surveyors, if they had no experience with the material, to put the work into the hands of a contractor, or of someone with experience. The tar itself varied considerably in quality, even from the same works; and there were many other details about it which made for success or failure.

Another New Gas, "Etherion."—The New York Correspondent of the "Standard" reports that at a meeting of the American Association for the Advancement of Science, Mr. Charles Brush made a preliminary announcement of the discovery of a new gas—a constituent of the atmosphere, and absorbed in many instances. Its chief characteristics are low tension and conductivity of heat surpassing those qualities in hydrogen one hundred times when impure, and, theoretically, a thousand times if pure. The discovery resulted from a search for secluded hydrogen. Mr. Brush calls his new gas "Etherion," because its attributes forbid its being confined to the earth's atmosphere, and indicate its interstellar distribution and relation to ether-filling space. He calculates its molecular velocity as over a hundred miles per second; its density one-thousandth of that of hydrogen; and its specific heat six thousand times that of hydrogen. He thinks it analyzable into several gases, forming a periodic group of new elements.

Progress of the Staines Reservoirs.—Our readers will remember that the important scheme of reservoirs designed by Messrs. Hunter and Middleton, the Engineers of the Staines Joint Committee, was commenced on the 30th of April last, when the Chairman of the Committee (Mr. E. Boulnois, M.P.) cut the first turf. We learn from the Engineers that the works, of which a description has been given in the "JOURNAL" (Vol. LXXI., pp. 996, 1065), are making very satisfactory progress. Nearly 2¼ miles of stripping for the banks, or about 50 per cent. of the whole length of the bench, has been done. Some 2200 yards of the excavations of the puddle trench have been opened, and about 1100 yards bottomed and filled with clay—700 yards being filled to the ground-level. Excavations have been commenced for the inlet and outlet towers of the reservoirs; and a start will be made immediately with the inlet from the Thames and the aqueduct. The Contractors for the works are Messrs. John Aird and Sons, who have about 1200 men upon the ground, together with four steam-navvies, four pugmills, and several locomotives and steam-cranes.

REGISTER OF PATENTS.

Safety Appliances for Gasholders.—Hacking, L. A., of Blackburn. No. 17,854; July 30, 1897.

This arrangement is more especially applicable to acetylene holders; its object being to provide means whereby, when holders become overcharged with gas, the surplus (instead of escaping through the water-joint) "is conveyed to some distance or place of safety, or to another gasholder for storage, thus preventing liability of explosion."

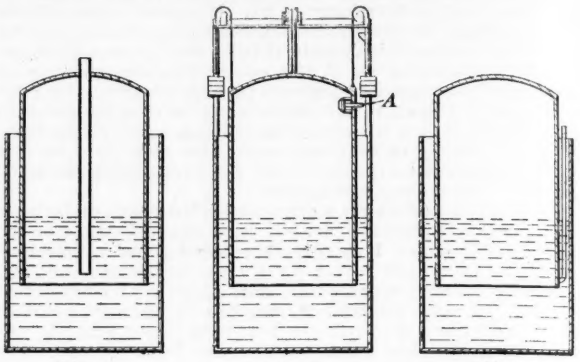


Fig. 1. *Fig. 2.* *Fig. 3.*

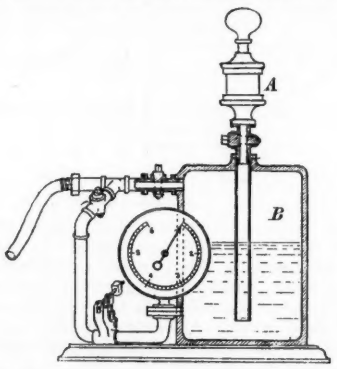
According to the arrangement shown in fig. 1, in the bell of the holder is fixed a vertical pipe or tube, one end of which protrudes from the dome, and the lower end dips into the water in which the holder floats. When it contains an ordinary charge of gas, the lower end of the pipe is sealed; but when the bell is overcharged, it rises until the lower end of the pipe is above the water-level, and the gas escapes by the pipe.

Instead of the long pipe, in some cases a valve A (fig. 2) is used, fixed in the top of the bell or to a short pipe in same; and when the latter or the dome rises to beyond a given point, the valve is opened by coming into contact with a stop-piece, and the surplus gas escapes and may be conveyed to a point of safety or storage.

The escape-pipe can, however, be attached to the floating bell (fig. 3) at such a height that the opening into it, under an ordinary charge of gas, is below the level of the water; but when surplus gas is driven into the holder, the opening rises above the level of the water, and allows the gas to escape. The pipe referred to can be attached to the outside of the bell, and between the latter and the water-container.

Tracing Leakage in Gas-Pipes.—Jensen, G. J. G., of Victoria Street, S.W. No. 20,421; Sept. 6, 1897.

The patentee proposes to test gas-pipes for leakage "by pumping fumes or gases into the pipes and tracing their escape by the reagent of the fumes or gases," concerning which he says: "I am aware that a somewhat similar apparatus is already used for charging pipes with fumes or gases under pressure, any leakage in the pipes being detected by sight or smell. My apparatus can be used in the same way; but, in addition to this, it provides a means of detecting leakages which are too minute to be discovered by sight or smell. I am also able to employ a light gas in place of the dense fumes generally used, which fumes are liable to temporarily stop up minute leaks and prevent their detection.

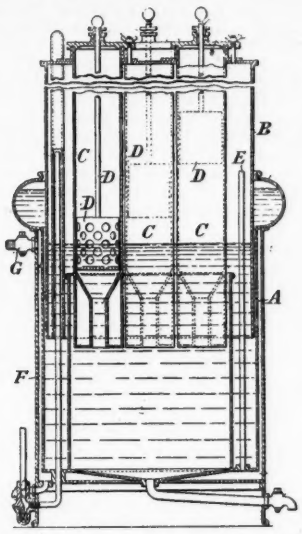


The arrangement, as shown, consists of a force-pump or similar appliance A, wherewith the pipes are charged with the gases or fumes generated in the chamber B. In this chamber is placed any chemical capable of generating fumes or gases traceable by a reagent—such as termeric, in the case of ammonia. If termeric test paper be passed over the surface of the pipe tested, its yellow colour will be turned brown if it passes over a leak in the pipe through which the ammonia gas is escaping. To the apparatus is attached a gauge to indicate any alteration in the pressure within the pipes.

Generating Acetylene.—Bean, H. R., of Plaistow, and Ringwood, H., of Poplar, E. No. 21,114; Sept. 14, 1897.

This is a modification of patent No. 5756 of 1897—designed to make the apparatus referred to a continuous working machine. The generator A is provided with a bell or sliding gasholder B, which rises or falls according as the supply of gas increases or diminishes. C are a number (three are shown) of gas-generating chambers or cylinders, secured to the cover of the holder. Their covers are hermetically secured in position by thumb-nuts, so that they can be easily removed for recharging with carbide; and each cylinder is placed in communication with the interior of the holder by a pipe controlled by a cock. D are perforated

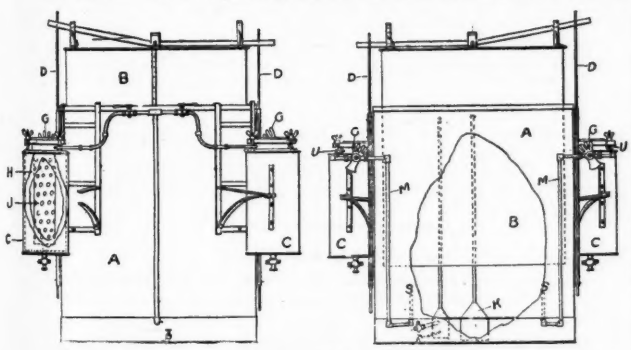
baskets, for containing the carbide, attached to the lower ends of rods which pass up through the cylinders C and out through stuffing-boxes in the covers; the upper ends of the rods being provided with handles to limit the extent to which they can be lowered. The baskets are arranged at different heights in their respective generating chambers, in such a manner that when the contents of the first basket are exhausted the next highest basket is brought into operation by the sinking of the holder caused by the consumption of the gas.



After the apparatus has been filled with water, and the baskets D have been charged with carbide, one of them is lowered until its contents are immersed in the water; the other baskets being also arranged at the proper heights to ensure continuous operation as above described. The gas as generated passes into the holder, from which it travels down the pipe E into the condensing chamber F surrounding the water-container, and from which it is drawn off as desired for consumption through the cock G. When the carbide contained in the first basket is exhausted, the gradual consumption of gas will cause the gasholder to drop until the second basket reaches the water, and so on.

Generating Acetylene.—Benjamin, J., of Swansea. No. 27,065; Nov. 19, 1897.

In this arrangement there is an outer water-tank A, in which a holder B can rise and fall. On the outside of A are fixed one or more water-jackets C, in each of which are cylinders H, containing the carbide-baskets J. The water necessary to generate acetylene in these cylinders is supplied from A by the pipes M. It enters at S, and passes into the cylinders at U. The gas generated enters the holder at the bottom by the well K. To the top of the holder are fixed rods D, which slide in

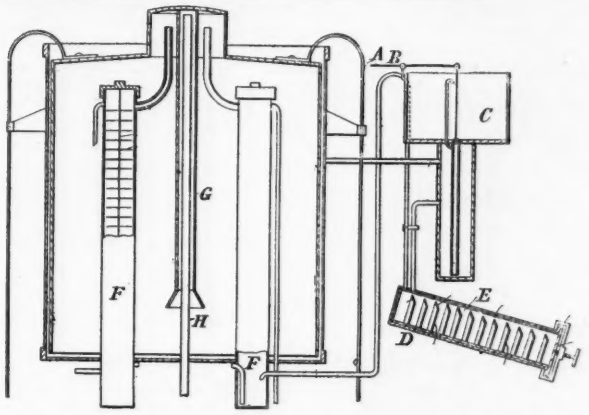


grooved tubes by the side of the carbide cylinders. In certain positions on these rods are projections or teeth, which act on the cogs of the crank G, and open or shut a cock in the pipe M. The gas passes out by the well L to the outlet-pipe. The holder and rods then gradually fall by their own weight; and the points on the rods again coming into contact with the crank G (but this time being the reverse motion), it opens the cock in the pipe M and lets in fresh water upon the carbide, when a repetition of the movements takes place, with a continuous supply of gas.

Manufacturing and Storing Acetylene.—Owens, W., of Pontardawe. No. 1625; Jan. 20, 1898.

In order to supply water to the calcic carbide employed in proportion to the consumption of the gas, there is mounted upon the moveable part of the holder shown in the engraving a projection—such as a bent spring A. This is caused to engage a lever B operating a valve between the cistern C or other source of water supply and the generator proper D. When, therefore, the holder descends to such an extent as to cause the projection to engage with the lever, the valve is opened, and a definite amount of water allowed to pass to the generator. Between the cistern and the generator there may also be a hand-valve (to be opened and maintained open to any desired extent), and a water-trap for the purpose of preventing any back-passage of gas from the generator to the cistern. The carbide holders E are cylindrical in shape, and are fitted with trays or partitions for holding the carbide. The trays with their upturned edges are designed so as to form compartments for the carbide; and to these compartments water passes, by a longitudinal duct or opening in consecutive order as decomposition takes place. The generator opens at the bottom, so as to prevent the escape of gas; and it is placed at a considerable angle.

From the generator pipes pass to the holder, and preferably to the lower part of one or more purifiers F. These purifiers consist of vertical cylinders or pipes fitted with condensing baffle-plates, attached to a central rod so as to be easily removed when desired. The purifiers are fitted with screw-caps at the top; and pipes are led from any source of water supply to the upper part, so as to discharge a stream of cold water over the baffle-plates for purposes of increased condensation.



The holder (surrounding and enclosing the purifiers) is provided with a dome at its highest point, to which the gas from the purifiers is led; and from the dome depends a pipe G to a position near the bottom of the holder, and containing within it a safety-pipe H, through which excess of gas passes when the moveable part of the holder has been raised to its highest position.

Assuming that the bottom of the purifiers, gasholder, and the cistern have been supplied with water, the cover taken off the generator, and the lever depressed so as to allow water to pass to the generator, the hand-valve is closed and the carbide holder with its charge of carbide is placed in position in the generator. The cover of the generator is now put on; and the apparatus is ready to commence work. The hand-valve is next opened to the desired extent; and the lever controlling the regulating-valve is slightly opened, so as to allow water to pass into the first compartment of the carbide holder. Acetylene is at once evolved, and passes through the purifier into the holder, raising it and bringing the projection away from and above the lever actuating the regulating-valve. When sufficient gas has been consumed to cause the holder to descend so as to make the projection engage with the lever actuating the regulating-valve, water is again supplied to the generator; the holder, by further evolution of gas, is again raised; and the same cycle of operations is gone through. The water passes through the compartments of the carbide holder in succession until the whole of the carbide has been decomposed.

Revolving Continuous Purifier.—Yeadon, A. E. N. & S. N., of Leeds. No. 2444; Jan. 31, 1898.

This invention relates to the use or application of a revolving horizontal cylinder for the purification of gas by hydrated lime, oxide of iron, or other analogous materials, as described in an illustrated article which appeared in the "JOURNAL" for the 19th ult., p. 152.

Gas and Oil Engines.—Bennett, J. F., and Moorwood, H. S. & T. P., of Sheffield. No. 13,130; June 11, 1898.

This invention relates to an improved construction of the cylinder and water-jacket of gas and oil engines, so that there may be no water-joints between the jacket, the combustion chamber, or the working barrel of the cylinder. Also to an arrangement of valve-box by means of which the valve-box or cover with the valves, the valve arms or levers which actuate them, and their appurtenant fittings may be taken off the cylinder for examination or repair without interfering with the gas and exhaust pipes or their connections, or any other motive parts of the engine.

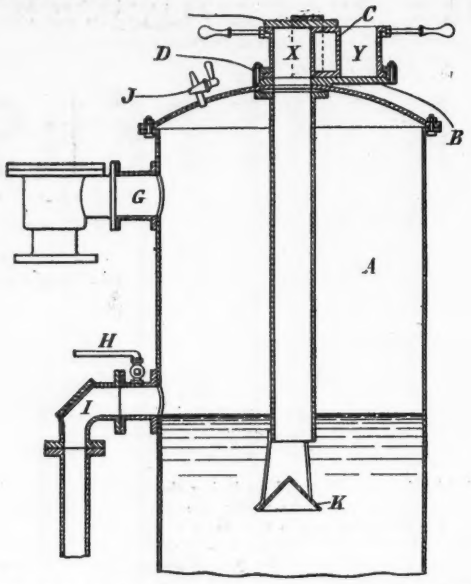
Generating Acetylene.—Abel, C. D.; a communication from P. Lipcke, of Charlottenburg, Germany. No. 13,387; June 15, 1898.

The patentee proposes to obviate certain enumerated dangers and disadvantages in many forms of acetylene generators, by the provision of both a mechanical closure and a water-seal for the supply tube or channel, whereby any "escape of acetylene gas and the danger of explosions is practically obviated." For this purpose, there is employed at the upper end of the charging channel a slide having one or more cavities for receiving the charges of carbide. The slide can be so moved that at one time the cavity is exposed so that it can be filled with a charge of carbide; and at another time it is brought with its lower opening over the charging tube or channel, the lower end of which is immersed in the water of the generator, while its upper opening is closed by a covering plate.

As shown on the next page (the upper part of the apparatus only) there is fixed on the top of the generating chamber A a plate B, on which the slide C is made to work air-tight; being held firmly down by the guide-ring D.

The slide has two charging-cavities X and Y, so arranged that in the one position of the slide one of the cavities is situated with its lower opening over the charging-tube E, the lower end of which is immersed in the water, while the upper opening of the cavity is closed by a covering plate, secured to the ring D by a bridge-piece. The second cavity, on the other hand, is not covered by the plate, and can consequently be charged with carbide. Then, when so charged, it is brought by the rotation of the slide over the charging-tube E, and the charge falls down into the water in the generator. When this has been done, the slide is turned so

as to bring the solid part between the two cavities over the opening of E, thus effectually closing it; while the lower end of the tube is immersed in the water, forming a water-seal. If now some of the carbide remains floating on the water within the tube, so as to generate acetylene therein, the pressure of the gas will effect the depression of the water-level in the tube until the gas contained therein escapes into the generating chamber, and passes away with the main body of gas generated therein to the holder through the discharge-pipe G.



For expelling the air contained in the generator on first starting, the chamber A is connected with the acetylene holder by a small pipe H, with stopcock, which is connected to the overflow-pipe I for maintaining the water-level. Thus, on starting, acetylene is introduced into the chamber A through the pipe H; and a cock provided at the top of the chamber is opened to allow of the escape of the air driven out by the entering acetylene. By this means the danger of the ignition of phosphoretted hydrogen in the generator is prevented, "as phosphoretted hydrogen can only exist in gaseous form in acetylene gas, and under these conditions will only explode at a temperature of 100° C. in the presence of air."

Below the lower immersed end of the charging-tube E is provided a distributing shield K, by means of which the descending charge of carbide is uniformly distributed in the water.

APPLICATIONS FOR LETTERS PATENT.

17,531.—Barratt, F. W., "Acetylene gas generators." Aug. 15.
17,575.—Buhlmann, G., "Self-igniting incandescent mantles for gas-light." Aug. 15.
17,581.—Moeller, J., "Incandescent oil-lamps." Aug. 15.
17,609.—Sherburn, W. H., "Stoves for use with gaseous, liquid, and other incandescent fuel." Aug. 16.
17,612.—Gillett, E. W. & C. R., "Acetylene gas generators." Aug. 16.
17,629.—Bertrand, P. H., "Gas cooking-stoves." Aug. 16.
17,661.—Mabille, A., "Indicating the pressure of gases." Aug. 16.
17,700.—Stendebach, C. F. P., "Automatic gas-igniter." Aug. 16.
17,718.—Ford-Lloyd, A., and Mondey, A. E., "Acetylene gas apparatus." Aug. 17.
17,731.—Butterfield, J. B., "Taps for steam, water, or gas." Aug. 17.
17,734.—Drivet, H., and Bilbie, J., "Acetylene generators." Aug. 17.
17,753.—Talbot, H., "Gas-lamps." Aug. 17.
17,754-5.—Pinkney, C. W., "Internal combustion engines." Aug. 17.
17,800.—Bell, J. R., "Generating acetylene." Aug. 18.
17,817.—Kirsten, C. P., "Signalling deficient flow of water and increase of temperature in liquids flowing through tubes and the like." Aug. 18.
17,824.—Little, G., "Coke conveyors." Aug. 18.
17,825.—Little, G., "Gas-retort settings." Aug. 18.
17,838.—Yeadon, A. E. N. & S. N., "Washer or scrubber for purifying gas." Aug. 19.
17,840.—Thorp, T., "Acetylene generators." Aug. 19.
17,885.—Trobach, K., and Schultze, K., "Incandescent gas-lamps." Aug. 19.
17,887.—Spencer, J. T., "Utilizing the waste heat given off from gas burners or stoves." Aug. 19.
17,892.—Lorrain, J. G., "Acetylene gas generators." A communication from L. Ward. Aug. 19.
17,920.—Buffington, A. L., "Acetylene generators and lamps." Aug. 19.
17,922.—Ford-Lloyd, A., and Mondey, A. E., "Acetylene gas apparatus." Aug. 19.
17,928.—Southall, J., "Gas and oil engines." Aug. 20.
17,940.—Parker, T., "Preventing the pollution of the atmosphere by the escape of combustible oil vapour or gas from oil or gas engines." Aug. 20.
17,956.—Melhuish, J. B., and Temple, F., "Production of acetylene gas." Aug. 20.
17,963.—O'Brien, J. O., of the firm of W. P. Thompson and Co., "Producing acetylene gas." A communication from P. P. H. Macé and P. J. de Burgue. Aug. 20.
17,986.—Twer, C., "Improvements in manufacturing wrought-iron gas-pipes." Aug. 20.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The "Water Famine" at the East-End.

Sir,—A great outcry is being made in the Press, charging the Directors of the East London Water Company with incompetence because they have, notwithstanding an exceptional drought, reverted temporarily to an intermittent (in place of a constant) service. The rainfall since last October has been 9 inches short; and consequently the rivers and springs throughout the South of England are abnormally low—lower, in fact, than they have been since 1874. At the present time, the water-level in the chalk is falling at the rate of something like half-an-inch per day, and must continue to fall for at least the next month or six weeks, even if we have the ordinary amount of rainfall. Some idea of the effect of this short rainfall may be gathered from the River Wandle. The amount of water passing down the river has continually decreased since April, 1897—that is, for more than 16 months. From the 21st of July to the 21st of August the amount of water passing down the Wandle fell over 2 million gallons per day; and the river is at the present far below its minimum summer flow.

It is absurd for persons to call a water supply reduced from 45 gallons to 25 gallons per head a "water famine." There are many towns and districts in England that never exceed this quantity. The inconvenience of an intermittent supply has been caused solely from the want of adequate house storage. It is the jerry-builders who, to increase their own profits, neglect to put proper cisterns into the houses they build. No house should be permitted to be inhabited which did not contain at least one galvanized iron cistern (protected against dirt) capable of holding 200 gallons, which would be sufficient with care for two days' supply for five people in an emergency. It is little short of criminal folly for school managers to build schools without providing adequate water storage. Children attending schools should never be placed in a position of being without water because of a temporary failure of a supply which may occur at any time from a burst main, frost, or other cause.

On the Continent, the authorities compel householders to provide themselves with a tank of very large dimensions. The constant service leads to waste; for it is impossible to prevent thoughtless people leaving their taps running. A garden sprinkler under ordinary pressure will waste 10,000 gallons of water in 24 hours. Few people have any idea of the amount of water which is daily wasted. If only one tap were left running full bore in each house in London, it would require a daily supply of no less than 8600 million gallons—a quantity which the Thames and the whole of the rivers south of the Humber combined at the present period would be unable to provide.

A. H. Smee,
Chief Medical Adviser, Gresham Life Assurance Society, Limited.

Aug. 26, 1898.

LEGAL INTELLIGENCE.

The Ventnor Gas and Water Company Fined for Deficient Water Supply.

The Ventnor Gas and Water Company have been fined by the Isle of Wight County Justices, sitting at Newport, for neglecting to furnish Ventnor with a sufficient supply of water. Mr. H. C. Damant, who prosecuted for the District Council, stated that during the latter part of July and the commencement of August the Council had not been able to obtain enough water to flush the sewers. Ventnor had been rapidly increasing in population and in favour with visitors; but for twenty years the Company had practically done nothing to augment their water supply. Mr. Wilton, who defended the Company, called Mr. J. S. Ineson, the Company's Manager and Secretary, who attributed the alleged default to the continued drought, and to the Council having neglected to provide cisterns for storing the water. The Bench held that the case had been proved; and they fined the Company the maximum penalty (£10) for the first day, and 1s. for each of five additional days, with £5 costs. Leave to appeal was granted.

Unlawful Use of Water.

At the Cinque Port Police Court, Margate, a few days since, Mr. A. R. Camus, of the Western Esplanade, Broadstairs, was charged by Mr. W. J. Latchford, on behalf of the Broadstairs Water Company, with having unlawfully used water supplied by the Company for other than domestic purposes—viz., for watering a lawn and garden. Mr. J. Emery appeared in support of the charge, and said in the latter part of July, owing to the water supply at Broadstairs becoming scarce, and as there were many instances of people wasting the water, it became necessary to take steps to prevent persons using water for watering lawns, &c., without having paid for it. The Company made a charge for water used for the purpose; but even this did not cover the cost. On the morning of the 25th of July, Mr. Latchford visited defendant's premises and found on the lawn a sprinkler at work using about 120 gallons an hour. He again went to the place in the afternoon with Mr. Williams, one of the Company's inspectors, and the sprinkler was still at work. He saw the defendant, and told him that he had not made any arrangement for using water in this way. The charge would have been £2 a year. At the time the wells and adits were getting low. He told defendant that if he did not stop using the water he would have to proceed against him; and defendant replied that he could do what he liked. Defendant said that as he did not use the water for domestic purposes in the winter, but had to pay for it, he thought he was entitled to employ it for his garden in the summer. Alfred Williams, inspector in the employ of the Company, gave corroborative evidence. Defendant protested against being charged with stealing the water, and said he told Mr. Latchford he was willing to pay for it. Last summer he informed the collector that he intended to use a sprinkler, and he was told that he would have to pay for it. He pointed out that he only used the water three months in the year, and the collector said no charge would be made for the use of a sprinkler. He was always willing to pay for the water. The Bench fined defendant 10s., and 13s. costs.

MISCELLANEOUS NEWS.

CROYDON COMMERCIAL GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held at the offices, Katharine Street, Croydon, last Friday—Mr. C. HUSSEY, J.P., in the chair.

The SECRETARY (Mr. W. J. Russell) having read the notice convening the meeting, the report and accounts, the principal features of which were dealt with in the "JOURNAL" last week, were presented.

The CHAIRMAN, in moving the adoption of the report, remarked that naturally the first thing the Directors referred to therein was the increase in the sale of gas. He had pleasure in noting that the total quantity of gas sold in the first half of this year showed an increase of 2·93 per cent. on the corresponding period of 1897. In comparing this with the returns of other gas companies, it came out very favourably indeed. Some were higher, and others were lower; but he thought, taking into consideration the very mild January and February—exceptionally mild as those months were—and also bearing in mind the fact that the Corporation were extending the electric light all they possibly could, by laying it on in the main roads—the increase must be regarded as exceedingly satisfactory. The receipts for residuals showed a reduction of £1432, arising partly from the still further fall in the market value of tar, and also from a reduction of 7208 tons in the bulk of coal used, and the consequent diminution in the quantities of residuals made—coke being 4324 tons less. Tar, as they knew, had been a great drug in the market for a considerable time. It was a residual which gave a good sum to their income; and had they made as much in the last half year as previously, they would have had an additional £900 to go to revenue. The price of coke had been augmented, consequent on their having less to dispose of owing to using less coal, and also to employing coke as fuel in the manufacture of carburetted water gas. The loss on the short supply was not so great, because the average price had been 2s. 6d. per ton more in the past half year than it was in the corresponding period of 1897; so that it was lucky for them that they were able to get a better price. Though the quantity of gas sold was greater than in the first half of last year, the expenditure upon coal, oil, &c., had been £2145 less; and there had been a saving also of £579 in wages. They considered this to a very large extent had been brought about by the introduction of carburetted water gas, which they thought had been a splendid success, as it had not only benefited the shareholders but the consumers also, because the Company had actually been supplying gas of higher quality than before this gas was introduced. There could be no doubt, he thought, that the money expended in erecting the water-gas plant had resulted in a very good return indeed. Large numbers of additional gas cooking and heating stoves had been fixed; and 324 small houses had been fitted up and supplied with gas under the weekly prepayment and automatic meter systems during the half year. They had supplied 412 extra meters; and the total number of consumers was now no less than 12,446. The shareholders would remember that on the last occasion Mr. Dalziel stated, or strongly hinted, that it was quite time the proprietors stopped the Directors spending further capital. Mr. Woodall at the time pointed out the consequences that would follow if such a course were adopted—viz., that they would have to shut up shop; and there was not the slightest doubt they would have to do so. Let them consider what the consequences would have been in the past half year if Mr. Dalziel had persuaded the Directors to adopt his view of the matter. They would have had to say to every one of the 412 additional persons who applied for gas that they could not supply them, because the proprietors had stopped the Directors spending more money. They would have wanted this number of meters, and been unable to furnish them. He did not think it was the desire of the proprietors to prevent the Directors spending capital in a proper way; and he did not believe they would ever do so. They had no less than 4891 stoves on hire; and though the electric light, as he had already mentioned, was spreading in all directions, and they had had to remove several lamps from the roads, they had still an increase of five public lamps over the number in the previous half year. They had now a total of 2086; so that the Corporation were still friendly with them in certain districts. The capital expended during the past six months had amounted to £7907, the greater portion of which was for laying new mains and services, and purchasing gas stoves and fittings. All these things brought in a good return; and he was sure the proprietors would never stop the Directors spending money in this direction. They had also paid what they had contemplated for the water-gas plant. They sold £2500 of 5 per cent. perpetual debenture stock, and £5000 of consolidated "B" ordinary stock of the Company in February last. The former realized £4000, or an average of £160 per £100 stock; the latter £13,511, or an average of £270 4s. 4d. per cent. This was not quite so high a sum as they had previously realized; but it was very good indeed. The sale resulted in a premium of £9885 11s. 10d., on which they would pay no dividend. The accounts for the half year showed that, after placing £500 to the reserve fund (which they would always look after as much as they could, because they believed it to be the backbone of the Company), the amount available for division was £15,405, and there was a balance of £594 to be carried forward after payment of the usual dividends. He thought that when the proprietors took into consideration the fact that their plant was good—and everything, Mr. Helps assured him, was kept up to the highest point—and that they had charged everything to revenue which could be legitimately charged thereto, they would agree that it was most gratifying they had had so satisfactory a half year. They had one great advantage in an excellent contract for coal which was still running. Some companies had been obliged to make fresh contracts at 1s. 6d. per ton more than the Croydon Company were now paying. If they had had to do this, they could not have shown so excellent a balance-sheet. They could only hope that, when their present contract was run out, they would be able to secure equally good terms as now, and to show the proprietors an equally good balance-sheet. He would only say, in conclusion, that he knew some had thought they had been spending capital a little more freely than they ought to have done; but the Directors had always aimed at meeting the demand, for they considered this the only wise course to adopt. Let them take for a moment the argument as to spending capital. If they went back to 1884, when the Company charged 3s. 6d. per 1000 cubic feet for gas, and took the present price of 2s. 8d. per 1000 cubic feet, there was a difference of 10d. Supposing they were selling gas now at 3s. 6d., there would be an addition to their revenue of £26,000 per annum. He thought this was most satisfactory to the proprietors as well as to the consumers, for they must not forget the object they had in view in reducing the price of gas, which was to induce people to go in for heating and cooking by it. This must not be lost sight of by the proprietors; the reduction in the price of gas having produced great results in increasing the number of consumers.

Mr. LAMBERT seconded the motion; and it was at once carried.

Mr. CORBET WOODALL proposed that the usual dividends at the rate of 14 per cent. per annum on the consolidated "A" ordinary stock, 11 per cent. per annum on the "B" stock, and 9 per cent. per annum on the "C" stock and Carshalton capital ordinary shares, be paid. He said he had great pleasure in proposing this, as the dividends had been earned.

Dr. THOMPSON seconded the motion; and it was agreed to.

A vote of thanks having been accorded to the Directors,

The CHAIRMAN replied, and proposed a similar vote to the Manager (Mr. Helps), the Secretary (Mr. Russell), and to the staff generally for the interest they took in the affairs of the Company. He alluded to the admirable way in which their work was done, and to the good understanding which existed among the workmen.

The motion having been carried unanimously,

Mr. HELPS and Mr. RUSSELL responded, and the proceedings closed.

TOTTENHAM AND EDMONTON GAS COMPANY.

The Ordinary General Meeting of this Company was held at the Offices, Willoughby Lane, Tottenham, last Saturday—Mr. CORBET WOODALL in the chair. There was only a small attendance of shareholders.

The report and statement of accounts for the half year ending June 30, noticed in the "JOURNAL" last week, having been taken as read,

The CHAIRMAN, in moving their adoption, said that upon the accounts he had not much to say. He hoped the small attendance was evidence that the shareholders generally had read the report and accounts, and had found them so satisfactory that it was not necessary for them to attend to ask questions. The half year had been a very successful one. It was quite true they did not show a balance of profits sufficient to pay the dividends they recommended. They drew from their undivided balance a little more than £600. But the first half of the year was usually the least profitable; the expenses in proportion to the revenue being heavier than in the second half. They had spent within a pound or two of £2000 more upon repairs, maintenance, and renewals of works than they did in the corresponding half of 1897. A very simple calculation would show that if they had expended the same amount as then, they would have had a balance of £1400 to the good. He repeated what he had so often said—that, in his opinion, it was the falsest economy to consider too carefully the amount of money to be spent on repairs, and the upholding of the fabric and apparatus of the Company. They kept their works in thoroughly good order, and were very careful not to charge anything against capital account that could be fairly and legitimately charged against revenue. No doubt the effect of this in some half years—as, for instance, in the six months just passed—was to hit the revenue rather heavily; but the effect in the long run was not only beneficial to the Company but also to the gas consumers of the district. If they were tempted to spend out of capital account, it was a permanent and continuing charge, the interest upon which had to be borne by the consumers. The growth of the Company was eminently satisfactory. There had been an increase in the quantity of gas sold of more than 7 per cent. over the corresponding half of last year. This was largely due to the continued increase of the prepayment system of supply. The number of meters of this character fixed during the half year had increased some 30 per cent. as compared with the first half of last year. It was evident that the consumers were satisfied, because only a few discontinued the supply. The Directors would do their utmost to increase this part of the business, because the number of houses to be supplied was so enormous that the field was a vast one to deal with. Notwithstanding the fact that they had not earned their dividends for the half year, they had, during the whole year up to June 30, added to their balances—whether reserve, insurance, or undivided—something like £1450, after paying the dividends. With regard to the Act of Parliament which since the last meeting had received the Royal Assent, the proprietors were aware that the Bill had two objects; the first being to authorize the Company to raise a considerable amount of additional capital, and to convert several classes of their stocks into a new denomination. It was their intention, when the Bill was drafted, to make only one class—viz., a 5 per cent. stock; but difficulties of a very serious character presented themselves in regard to the payment of dividends upon the altered 10 per cent. and 7 per cent. stock (that was to say, the 7 per cent. in relation to the 10 per cent.), and so they finally decided, with the approval of the District Council and Parliament, to create two stocks, one of 5 and the other of 3½ per cent. They thus doubled the whole stock of the Company; making the £60,000 of 10 per cent. "A" stock into £120,000 of 5 per cent., and the £125,260 of "B" stock into £250,520 of 3½ per cent. stock. This conversion did not in the slightest degree affect the dividend to be paid to the shareholders, nor the amount of money they needed to take from the consumers to pay it. But it made the nominal dividend more in harmony with the actual one received by the shareholders. They were dividing 12 per cent. upon their "A" stock. But, as everybody knew, it was only a comparatively small amount of capital that received 12 per cent.; and it was issued a very long time ago. It was the same with the "B" stock. It had been sold by auction, and those who bought it were receiving only 4 per cent., or a trifle over. Therefore it created a false impression in the minds of consumers and people of the district when they read of the Company paying 12 and 9 per cent. to the shareholders. Henceforth they would pay—until they reduced the price of gas still further—6 and 4½ per cent. As a necessity of this doubling of the stock, they would halve the amount of the advantage which came to the shareholders under the sliding-scale. At present they received 5s. per cent. for every penny reduction below the standard price; whereas in future it would be 2s. 6d.

per cent. upon the increased amount. It was suggested in Parliament that, instead of their receiving 2s. 6d. per cent. on the 7 per cent. stock, it should be a smaller amount. But they were able, to their great relief, to satisfy the authorities of the House that no true advantage would result to consumers from such a limitation; and they would therefore continue to pay the 7 per cent. stockholders the same rate of increase as they paid to the holders of the 10 per cent. stock. The additional capital they were authorized to raise was £150,000, which was 5 per cent. stock, and would be sold by auction. In addition to this they obtained authority to increase the amount of their borrowing powers upon the old capital already issued and subscribed, from £60,000 to £100,000; so that upon the old capital they had an added borrowing power of £40,000. On the new capital, with the cordial assent of the Tottenham District Council, who watched the Bill most carefully for the ratepayers, they had taken 33 per cent. of borrowing powers, giving them £50,000 under that head. Consequently, they had £90,000 additional borrowing powers, which added to the £150,000 of new stock gave them £240,000. The illuminating power of the gas had been raised from 14 to 15 candles; and the Directors had accepted certain provisions with regard to the purity of the gas which would no doubt inure to the advantage of the consumers, though they would add somewhat to the future cost of purification. The Directors had given notice to the Local Authorities of their intention to apply to the Board of Trade for a Provisional Order in the coming session for authority to supply the electric light; but they would not proceed with it if it were in opposition to the wishes of the authorities. Their only desire was to work with them, and, if there was a demand for the electric light in the district, to meet it. They were absolutely confident that they could supply the light at a lower rate than any independent company, or than the Local Authorities; and they were quite willing to do it if the authorities wished.

Mr. H. Bailey seconded the motion.

Mr. H. D. Ellis expressed his pleasure at hearing what the Chairman had said in regard to defraying expenses of maintenance and wear and tear out of revenue. Nothing could be more sound or beneficial to a company than to charge against revenue the full amount requisite for the repair and maintenance of works, instead of showing a large balance carried to the profit and loss account. He was certain the Company would, under the present *régime*, continue to carry out this policy. He supposed that during the past six months they had made as much water gas as in the corresponding period of 1897; yet notwithstanding this the residual products showed an increased revenue. If he might be allowed to express the opinion of the shareholders, he would say that they appreciated the way in which the Directors had carried on the business of the Company during the past half year.

The motion was carried unanimously.

Sir H. Cartwright next proposed that dividends be declared at the rate of 12 per cent. per annum on the "A" stock, and 9 per cent. per annum on the "B" and "C" stocks, both less income-tax, for the half year ended June 30.

Mr. G. T. Watson seconded the motion, and it was adopted.

The retiring Directors (Mr. D. Ford Goddard, M.P., and Mr. Corbet Woodall) and Auditor (Mr. G. T. Watson) having been re-elected,

A vote of thanks was accorded to the Chairman, and the proceedings closed.

BARNET DISTRICT GAS AND WATER COMPANY.

The Half-Yearly Meeting of this Company was held last Friday, at the Albion Tavern, Aldersgate Street, E.C.—Mr. James Glaisher, F.R.S., in the chair.

The Secretary (Mr. Alfred Lass, F.C.A.) read the notice convening the meeting; and the accounts, which were referred to in the "Journal" for the 16th inst (p. 394), were taken as read.

The Chairman, in moving the adoption of the report and accounts, remarked that the latter were so clear that they spoke for themselves; but he should like to say a few words regarding the working of the Company during the six months to June 30 last. They had carbonized 3817 tons of coal, which was 48 tons less than in the corresponding period of last year. The quantity of gas made was 41,772,000 cubic feet, or at the rate of 10,944 cubic feet per ton. It was therefore clear that everyone connected with the works had done his very best for the Company. The unaccounted-for gas amounted to 2,659,000 cubic feet, which was a little more than 6¼ per cent., or almost the same as last year. The gas sold totalled to 38,486,420 cubic feet; being at the rate of 10,083 cubic feet per ton of coal carbonized. It would thus be seen that the Company received payment for over 10,000 cubic feet of gas for every ton of coal used at the works. They had made 3635 chaldrons of coke during the half year, 129 chaldrons of breeze, 40,078 gallons of tar, and 40⅞ tons of sulphate of ammonia. They had received for public and private lighting during the six months under review £7461; being £153 more than in the corresponding period of last year. For coke they had received £11 more; for breeze, £5 more; but for tar, £9 less. The sulphate of ammonia realized £71 more than in the same period of 1897; so that from residuals they had altogether an increased revenue of £78. The total revenue for the gas portion of the business was £9371, or £243 more than last year. On the other hand, coal had cost them £2893, which was very nearly the same amount as last year. The total manufacturing charges were £64 more; distribution cost £27 more; rates and taxes, £32 more; and management, £27 more. There was also an item which did not exist at all in the preceding year—namely, parliamentary expenses. This outlay was incurred in looking after a Bill promoted by the Enfield Gas Company, in which they were interested. The total expenditure on gas account was £6183, or £297 more than in the corresponding six months of 1897. The balance of profit was therefore £54 less than last year. He was a little disappointed at this result, seeing that they had produced a greater bulk of gas per ton of coal used, and had also sold a larger quantity. The two items, rates and taxes and parliamentary expenses, were, however, responsible for the small decrease. Looking at all the items in the accounts of the gas department, he thought the result was very satisfactory indeed. Turning to the water portion of the business, it would be seen that the total revenue from this source for the six months was £556 in excess of that for the corresponding period of the preceding year. The outlay on maintenance was £237 more than last year; and management cost £58 more. The total expenditure on the water portion of the business was £3615, or £295 more than last year; and the balance carried to profit and loss account was £6797, or an increase of £260. Everything would be satisfactory if they had all the water they needed. The well at Potter's Bar, though not yielding as much as they wished it to do, had been of such assistance to them that they had had no occasion this year to stop the use of water for the roads, or even to send out notices to prevent waste. The Directors hoped that, the season being now so far advanced, there would be no need to send out such notices at all. He might here just say a few words about the East Barnet well. They were now something more than 200 feet from the surface, and about 70 feet in the chalk. From the surface down to the chalk they had fixed cast-iron cylinders; and outside these cylinders had been cemented. Therefore not a drop of water could enter the well, except it came from the chalk. The amount of water now in the East Barnet well was much greater than they had in the Potter's Bar well when at the same depth. This well therefore held out great promise of ultimately providing them with a very large addition to their resources. Taking the business of the Company altogether, he thought the prospect was very bright.

Mr. Charles Horsley, J.P., in seconding the motion, said he hoped that, when completed, the Potter's Bar well would yield a still larger quantity of water than it was doing at present.

The resolution was carried unanimously.

Dividends were afterwards declared at the rate of 9 per cent. per annum on the "A" and "C" stocks, 8 per cent. on the "B" stock, and £6 6s. per cent. on the "D" capital gas and water stocks, all less income-tax.

The Chairman, in proposing a vote of thanks to the officials, said the work of the Company could not possibly be better done than it was by the present staff.

The motion was carried unanimously; and Messrs. Lass, Martin, and Wright thanked the meeting for the confidence bestowed in them.

The Chairman, in replying to a vote of thanks to the Board, said he had often hoped that he might one day have the pleasure of proposing the payment of the full statutory dividends on the different classes of shares; but he was afraid now that this must be left to his successor. The Company was placed on such a good foundation, and was so secure, that the dividend was certain to increase ultimately.

The proceedings then terminated.

PROVINCIAL GAS AND WATER COMPANIES.

Gas Companies.

The profit made by the Altrincham Gas Company in the six months ending June 30 was £3753, as compared with £3530 in the first half of 1897, when the price of gas during the March quarter was 2d. per 1000 cubic feet higher. At the ordinary general meeting of the Company last Tuesday, the amount available for distribution was £3929; and the full statutory dividends were declared, leaving a balance of £788. In order to supply the increasing demand for gas, of which 58 million cubic feet were sold in the six months, it has become necessary to erect, under the supervision of the Manager (Mr. Lamb), an additional retort-house. To meet the expense of this extension, further capital is to be raised.

At the half-yearly general meeting of the Brighton and Hove Gas Company on the 9th prox., the Directors will report that the sale of gas in the six months ending June 30 increased by 4 per cent. as compared with the corresponding period of 1897; and that the amount realized for residual products showed a satisfactory improvement. There were sold for public and private lighting 478,686,700 cubic feet of gas, producing a revenue of £66,854; the rental of meters, fittings, and stoves was £3701; residuals produced £12,881; and the total receipts were £83,704. The manufacture of gas entailed an expenditure of £42,010 (£28,116 being for coal, oil, &c.); its distribution cost £8077; management came to £4350; and the total expenditure was £58,377. The balance carried to the profit and loss account is £25,327; and the amount available for distribution is £26,499. The sum required for dividends at the rates of 11½, 8½, and 6 per cent. per annum on the three classes of stock, which the Directors recommend, being £23,449, there will be a balance of £3050 to be carried forward. Under the supervision of the Engineer (Mr. J. Cash), 33,037 tons of coal and 425,791 gallons of oil were employed in the manufacture of gas; the estimated production of residuals being: Coke, 19,822 tons; breeze, 1802 tons; tar, 504,640 gallons; and ammoniacal liquor, 722,599 gallons.

The accounts presented at the half-yearly meeting of the Cork Gas Company last Thursday showed that the revenue from the sale of gas for public and private lighting in the six months ending June 30 amounted to £19,842; residuals produced £5502; and the total income was £25,358. The expenditure being £18,549, there was a balance of £6809 to go to the profit and loss account. There was a decrease in the amount of private rental as compared with the first half of 1897. This, however, was caused entirely by the reduction made in the price, as the consumption had increased. There was a small increase in the revenue from public lighting. The receipts for residuals were higher; and the Directors expected a further improvement in this direction, as the price of sulphate of ammonia had advanced. The balance available for distribution was £5393; and as the usual dividend amounted to £5652, the difference (£259) would have to be taken from the reserve fund. The Resident Engineer (Mr. T. P. Travers) reported that the works and plant had been maintained in good order and repair during the half year.

The report which the Directors of the Falmouth Gas Company will present to the shareholders next Thursday opens with an expression of regret that it is not so satisfactory as they could have wished. When the last reduction in the price of gas was made, it was thought the increase in the consumption would be sufficient in a short time to counterbalance the smaller profit obtainable from a lowering of the charge; but various circumstances have combined to upset these calculations. The increase in the consumption has been small; while the introduction of incandescent burners and the increase in the cost of coal all tend to lessen the profit. The long-continued strike of the coal miners has so raised the price of raw material that the Directors are reluctantly obliged to announce an increase in the charge for gas after Sept. 30 of 4d. per 1000 cubic feet;

making the price 3s. 4d., less the usual discounts. The Corporation have at last consented to fix some incandescent lights in the public lamps; and the Directors express the hope that before long the whole of the lamps will be fitted with these burners. The accounts accompanying the report show that the sale of 31,327,300 cubic feet of gas produced (less discounts) £4521; and 2,339,500 cubic feet sold through prepayment meters brought in £436. The amount available for distribution is £1650, which will enable the Directors to pay the full dividend.

At the meeting of the Hastings and St. Leonards Gas Company next Thursday, the Directors will report that the business of the Company continues in a very satisfactory condition. The increased quantity of gas sold in the six months ending June 30, as compared with the corresponding period of the previous year, was 8,632,200 cubic feet, or nearly 5 per cent.—a very gratifying fact considering the exceptionally fine and mild weather prevailing at the beginning of the half year. The receipts from private lighting were £26,000; from public and contract lighting, £3224; residuals produced £6513; and the total revenue was £37,623. The expenditure on the manufacture of gas was £21,448 (coal, oil, &c., costing £14,064); on its distribution, £1739; and on management, £1207—the total expenditure being £26,534. The balance carried to the profit and loss account is £11,089; and it is proposed to pay the statutory dividend of 13 per cent. per annum on the £25 shares, and of 10 per cent. per annum on the £20 shares. In view of the possible contingencies that may arise under the Workmen's Compensation Act, the Directors have deemed it advisable to augment the insurance fund by transferring from the profit and loss account £1792, as authorized by the Company's Act. Great improvements have been made, under the supervision of the Engineer and Manager (Mr. C. E. Botley), in the manufacturing details, which have resulted in an exceedingly good half-year's working. The quantity of coal and cannel carbonized was 16,282 tons; and, in addition, 89,930 gallons of oil were used. The amount of gas made was 196,193,000 cubic feet, including 28,340,000 cubic feet of oil gas. The estimated quantities of residuals produced were: Coke, 10,089 tons 16 cwt.; breeze, 663 tons 17 cwt.; tar, 146,776 gallons; ammoniacal liquor, 284,587 gallons. As the capital of the Company has been overspent to the extent of £16,785, the Directors purpose issuing more shares; and the necessary authority for so doing will be asked at the meeting.

The half-yearly general meeting of the Kingston Gas Company was held on the 18th inst.—Mr. P. Jones, J.P., in the chair. The accounts for the six months ending June 30 showed that the sale of gas and the rental of meters produced £25,377. In the corresponding period of 1896, it was only £22,837; showing an increase of £2540 in two years, notwithstanding the competition of the electric light, the more extended use of incandescent gas-burners, and the reductions made to the Local Authorities for public lighting. The business in residuals was better last half year; but, on the other hand, there was a material addition to the cost of coal, to the carbonizing wages (the make of gas having gone up more than 11 million cubic feet), and to the amount paid for repairing and renewing meters. Nevertheless, the net profit on the half-year's working was £5242; enabling the maximum dividends to be paid, and leaving a surplus of more than £400. The Directors, Secretary (Mr. J. A. Fricker), and Engineer (Mr. H. F. Packham) were complimented on their efficient conduct of the Company's business.

The revenue from the sale of gas by the Riddings District Gas Company, in the six months ending June 30, was £1600; and the total receipts amounted to £1854. The expenditure was £1179; so that there was a balance of £675. The balance on the profit and loss account was £1788, out of which a dividend for the half year at the rate of 5 per cent. per annum, free of income-tax, has been declared.

The annual general meeting of the Salisbury Gas Company was held on the 17th inst.—Mr. G. Fullford in the chair. The accounts presented enabled the Directors to recommend dividends ranging from 5 to 10 per cent. per annum. In moving the adoption of the report, the Chairman remarked that the results of the past year's working had been satisfactory. Though the price of gas had been reduced, and some concessions made to large consumers, and though the unusually mild and light winter of 1897-8 was not favourable to a large consumption of gas or of coke, the profit for the year was sufficient to pay full dividends. Coal had cost more, partly because more was required, and also on account of prices being slightly higher; but the other items of expenditure called for no particular remark. The amount received for gas was £93 less, though the quantity sold was 1¼ million cubic feet more; but the lower price charged by the Company accounted for the decrease. Sales of coke were well maintained, notwithstanding the mild season. During the past year great improvements had been made in the machinery, plant, and works generally. A new retort-house with four beds of retorts on the newest principle had been built to enable the Manager to meet the increasing demands for gas. These improvements were necessary, notwithstanding the extensive adoption of Welsbach burners. The demand for cooking and heating stoves increased; and the energies of the staff had been severely tested in keeping pace with the demand. Mr. Young seconded the proposition; and it was unanimously carried. A vote of thanks having been accorded to the Chairman, Directors, and officers of the Company, the Chairman, in responding, referred to the labours of their careful and energetic Secretary (Mr. A. Whitehead), and also spoke with appreciation of the Manager (Mr. Norton H. Humphrys), the principal officers, and the staff generally. Mr. Whitehead thanked the meeting for their courtesy and kindness; and Mr. Humphrys, speaking for himself and the staff generally, acknowledged the kindly remarks from the chair, which had been endorsed by the meeting. He said the reference to improved burners reminded him that, with the aid of modern appliances and reductions in price, he now supplied as much value for 1d. as could be had for 1s. when he first started in the gas industry nearly thirty years ago.

The Chairman of the Scarborough Gas Company (Mr. B. Fowler, J.P.) laid before the shareholders a good record of progress when moving the adoption of the report, noticed in the "JOURNAL" last week, at the half-yearly meeting of the Company on the 20th inst. The sale of gas in the six months ending June 30 showed an increase of close upon 7 million cubic feet on the quantity sold in the corresponding half of last year—or nearly 7 per cent. It was made up as follows: Quarterly consumers, 5,414,000 cubic feet; monthly consumers, 603,000 cubic feet; prepayment consumers, 778,000 cubic feet; public lighting, 166,000 cubic feet—total, 6,961,000 cubic feet. The Company had out on hire 1355 cooking-stoves. Taking the year, the increase was 9½ millions—4 per cent.—on the previous year. Comparing the gas sold during the year ending June last with that sold five years ago, the increase amounted to 40 million cubic feet, or nearly 20 per cent. in five years. Going back ten years, the increase was found to be 86 millions, or 54 per cent. The number of consumers had also greatly augmented—viz., from 4000 ten years ago to 6634 on the 30th of June last. In 1890, a system of monthly payment of accounts was introduced; and four-and-a-half years ago the penny-in-the-slot system was adopted. Under the former, the Company had 600 and under the latter 900 consumers. The total receipts were £18,967, or an increase of £1240 over those for the corresponding half of last year; and the payments, £13,370—an increase of £305 only. The balance carried to the profit and loss account was £5597—an increase of £935. These figures showed greater economy in working, owing to the new retorts and the new gasholder. On capital account they had spent £2549—chiefly on the new gasholder, and a payment on account for the water-gas installation. The extension of the manufacturing plant was in progress, and he hoped it would be completed by Christmas. The report was adopted, and the dividends recommended were declared. At the close of the ordinary meeting, a special meeting was held at which sanction was given for the conversion of the whole of the ordinary stocks in the capital of the Company, issued before the passing of the Company's Act of 1895, into one consolidated ordinary stock bearing a uniform dividend of 5 per cent. per annum. It was decided that the conversion should take effect not later than Jan. 1, 1899.

At the annual meeting of the Sunderland Gas Company on Thursday, the Directors will present accounts showing that the gas and meter rentals for the year ending June 30 amounted to £70,120, and residuals produced £21,956, as compared with £68,427 and £20,704 in the preceding year. The total revenue was £92,112, and the expenditure £74,932; leaving a balance of £17,180. The corresponding figures last year were £89,169, £71,555, and £17,614. The Directors in their report state that the prolonged strike of the engineers and the mildness of the past winter arrested to a considerable extent the rate of increase in the consumption of gas which prevailed during the preceding twelve months; and the advance in the cost of coal, labour, &c., has more than absorbed the increased revenue resulting from the transactions of the year covered by the accounts. Interim dividends of 5 and 4½ per cent. were paid in March; and the Directors will recommend similar payments.

The 53rd annual general meeting of the Taunton Gas Company was held last Tuesday, under the presidency of the Chairman (Mr. J. Barrett). The Secretary and Manager (Mr. A. J. Edwards) presented the report of the Directors, in which they expressed their pleasure in announcing that, notwithstanding the comparative mildness of the past winter, the quantity of gas sent out had been 65,567,000 cubic feet. Considerable progress had been made with the extension of the works; and a portion of the new plant for the manufacture of carburetted water gas had been brought into use and proved satisfactory. The Directors hoped to have all the works completed by next winter. The amount available for distribution was £3709, out of which the Directors recommended dividends of 5, 7, and 8 per cent. on the preference stock, yellow shares, and consolidated "A" stock for the past year, and at the rate of 7 per cent. per annum on the ordinary stock for the past half year. The payment of these dividends would absorb £2992, and leave £717 to be carried forward. The Chairman, in moving the adoption of the report, congratulated the shareholders on its favourable character. He said the quantity of gas sent out during the year was very satisfactory, considering the mild winter; but, notwithstanding this, they had been able to bring up the consumption to within 206,000 cubic feet of that of the previous year. This was about the quantity of gas formerly supplied to the Town Council for the public lamps. Referring to the new Welsbach burner, he remarked that, though it must effect a saving to the consumer, it was hoped that it would bring fresh customers to the Company. The penny-in-the-slot meters had been tried with marked success among the poorer residents; and the Directors trusted that, by proceeding cautiously, most of the artizans' houses in Taunton would be supplied with these meters. Mr. Barnicott seconded the motion; and it was carried. The thanks of the meeting having been accorded to the Chairman and Directors for their services, it was resolved to increase the salary of Mr. Edwards by £50 per annum. It was mentioned that he had superintended the erection of the new works without the assistance of a clerk of the works; and it could not have been done better. The quantity of gas sent out last year was largely in excess of that of previous years; and this consequently added to the Manager's duties. Mr. Edwards, in returning thanks, said it gave him great satisfaction to know that the way in which he had performed his duties merited the confidence of the shareholders.

The annual general meeting of the Waterford Gas Company was held on the 19th inst.—Mr. R. Hesketh Jones, J.P., in the chair. In the report the Directors reminded the shareholders that among the clauses in the Bill promoted by the Company in the past session was one seeking permission to apply the funds at any time for making application for a Provisional Order or Licence to supply electricity; another clause being to enable the Company to issue new capital to the consumers at par. Against both of these clauses the Corporation of Waterford petitioned, and they were withdrawn. At the request of the Corporation, a clause similar to that contained in the [Company's Act of 1877 was inserted, empowering that body to purchase the undertaking of the Company on or before May 16, 1901. The other main features of the Act were the consolidation of the shares into a 5 per cent. stock, with a sliding-scale of increased or decreased dividends of 1s. 3d. on every £100 of consolidated stock actually paid up when the price of gas charged by the Company shall have been 1d. below or above the standard rate of 4s. 9d. per 1000 cubic feet. Another clause relates to the hire of stoves, &c. Further capital is authorized to the extent of £24,000, with additional borrowing powers of £6000; thus adding £30,000 of additional capital. The accounts accompanying the report showed that the sale of gas (less discounts) produced £10,367; residuals, £2426—the total receipts being £12,810. The expenditure was £9288; and consequently the amount carried to the profit and loss account was £3522. The divisible balance was £2149; and the Directors recommended the payment of a dividend equivalent to 5 per cent. per annum on the consolidated stock, amounting to £1404—leaving £745 to be carried forward. The Chairman, in moving the adoption of the report, expressed his pleasure at laying before the proprietors the most favourable statement of accounts presented during

the Company's existence. The business during the past year had increased by 4 per cent. as compared with 1896-7; and the profits were more than sufficient to pay a dividend of 5½ per cent. on the consolidated stock of £56,400. The revenue for gas had increased from £9909 to £10,367; and the profits from £3146 to £3522. Next year the Directors hoped to pay a dividend at the rate of 5½ per cent. The new Act enabled them to raise £30,000 of additional capital, which, judging from the past, would carry them on for twenty years. The Corporation had now the power to purchase the Company's undertaking; and if the citizens decided to do this, he trusted the negotiations would be carried on in the same spirit of fairness and equity which had characterized the consideration of the clauses in the new Act of Parliament. Mr. Shaw seconded the motion. The Company's Engineer (Mr. George Anderson) expressed his gratification that the Company were getting on much more smoothly with everybody—the Corporation of Waterford included; for since they entered the city they had never progressed so well. The report was adopted, and the dividend recommended was declared.

The half-yearly general meeting of the Wellingborough Gas Company was held on the 22nd inst., when the accounts submitted showed that the sale of 35,908,039 cubic feet of gas to private consumers and 1,810,997 cubic feet for public lighting in the six months ending June 30 produced £5277, and that the total revenue was £6467. The expenditure on the manufacture of gas was £3849; on distribution, £311; and on management, £265. The total expenses were £4685; so that a balance of £1782 was carried to the profit and loss account. There was a sum of £2754 available for distribution; and dividends of 5½ per cent. on the "A" and "B" shares and of 4 per cent. on the "C" shares, free of income-tax, were declared. The quantity of gas sold showed an increase of nearly 8 per cent. on the first half of 1897. Additional mains and services were laid during the half year at a cost of £450; and further extensions are in progress. The alterations and enlargements at the works are being pushed forward, under the supervision of Mr. J. T. Lewis, the Engineer and Manager, so as to have some of the new plant ready for use during the coming winter season.

The Directors of the Wolverhampton Gas Company have issued their 93rd half-yearly statement of accounts, covering the six months ending June 30 last. They show that the net profit amounts to £6080; the addition of the balance brought forward making a total of £8679. There having been a decrease in the earnings of the Company from various causes, among which may be mentioned the extremely mild weather during the early part of the year, combined with a diminution in the demand for gas for manufacturing purposes, the Directors recommend the following dividends: 3 per cent. upon the preference stock, 5 per cent. upon the consolidated stock, and 3 per cent. upon the new ordinary stock, less income-tax. In the previous report, mention was made of extensive additions at the Stafford Road works. These are progressing rapidly, and to the satisfaction of the Directors. Of the additional capital authorized to be raised at the last meeting, £30,000 has been sold by auction, and the whole of the money paid up.

Water Companies.

The annual general meeting of the Lewes Water Company was held last Tuesday—Mr. F. Verrall in the chair. The report of the Directors showed an amount of £2292 available for distribution. Deducting the interim dividend of £1035 paid in March, there was left for disposal the sum of £1257. The Directors recommended dividends of 5, 3½, and 2½ per cent.; making 10, 7, and 5 per cent. for the year, with 15s. per share to the holders of original shares, in part payment of the arrears due to them. A proposed Water Board for Newhaven and Seaford having during the last session applied for powers to purchase the undertaking of the Newhaven and Seaford Water Company and construct additional works, including a pumping-station and water-mains at Ashcombe, within the Lewes Company's area of supply, the Directors instructed the Solicitor to oppose the Bill; and it was eventually thrown out, but not until the Company had been put to considerable expense in opposing it. The Manager (Mr. A. Wells) reported that the whole of the machinery and works were in a satisfactory condition. The report was adopted; and the dividends recommended were declared.

The 61st half-yearly meeting of the Luton Water Company was held last Thursday—Mr. B. Seebohm presiding. The Directors' report stated that the balance of the revenue account for the half year ended June 30 was £3156—an increase of £427 on the corresponding period of 1897. This would admit of the declaration of the maximum dividend of 4 per cent. on £105,500 consolidated ordinary stock, amounting to £2110; while the balance of £963 would be carried to the renewal and contingency fund, which now amounts to £2772. In moving the adoption of the report, the Chairman remarked that they had an unprecedented surplus and a largely increased revenue. This was accounted for by the growth of the town; while the drought and the new Corporation storm-water drainage scheme had dried up many of the old wells. They had had to lay on new water connections to an extent which they had never done before; and this would result in a permanent addition to the revenue. They had little difficulty in securing their dividends or in paying for extensions; while their expenses remained practically the same. They had recently sold £3000 more stock at a good premium. The report was adopted unanimously. The Company's Engineer (Mr. W. R. Phillips) pointed out that the level of the Company's wells and the line of saturation in the whole town had been affected by the Corporation's new drainage scheme.

At the half-yearly meeting of the Maidstone Water Company last Thursday, the Directors reported that their scheme for obtaining additional water from the North Downs of Kent had been abandoned on account of the excessive estimated cost. The Chairman (Mr. G. Marsham, J.P.) said the amount of water available daily since July 11 had been equal to rather more than 18 gallons per head of the population; and he thought that if the consumers in Maidstone had been economical, and had helped the Company as they might have done, there would have been no necessity for an intermittent supply at the present time. With regard to the Mid-Kent Company, he believed they had done their best to carry out the wish they expressed to provide the town with 100,000 gallons of water per day; but they had been unable to do so. People were inclined to throw stones at the Directors, and especially at their Chairman; but when they came to consider the Company's difficulties, he believed they would concede that the directorate had done the best they could for the town. Alderman C. Ellis (ex-Chairman of the Company) said the fault of the scarcity of water in the town did not rest with the Company, but with someone else. Unfortunately, the Mid-Kent Company had not been able to keep their promise. Replying to questions, Mr. Marsham said the Directors found they could not enter into any contract with the Mid-Kent Company with regard to the amount of water they should take; but they agreed to pay the price their neighbours asked, on the understanding that they should not be limited to any definite quantity. It transpired during the meeting that the expenses incurred by the Company in connection with the late typhoid epidemic reached a total of £7472. The Chairman said the Directors were unable to recommend any dividend on the ordinary shares at present, but they hoped to pay one of some sort in the next half year.

The half-yearly meeting of the South Staffordshire Water Company was held last Thursday—Mr. F. James in the chair. As already mentioned in the "JOURNAL" (*ante*, p. 387), there was a sum of £23,024 available for division; and the Directors recommended a dividend at the rate of 6 per cent. per annum, leaving £5174 to be carried forward. In moving the adoption of the report, the Chairman said the number of services laid on during the six months ending June 30 was 1828; making the total 96,681. The gross water-rates were in excess of the previous half year. On capital account, £8900 had been expended partly for the new reservoirs at Barr Beacon and Dudley, and the laying of between 9 and 10 miles of new mains. He congratulated the shareholders on the fact that the Company had not been called upon to curtail their supply, and remarked that, in his opinion, a constant service was more economical than an intermittent one. When householders were warned that the supply would be cut off at certain times, they generally stored water, much of which was ultimately wasted. At present the Directors were perfectly satisfied with their sources of supply, and over and over again they had ascertained from various public authorities taking the Company's water that the supply was most satisfactory. Sir Henry Wiggin seconded the motion. Mr. Houghton asked how the Directors proposed to deal with their servants under the Workmen's Compensation Act. The Chairman replied that the Company were insured under the old law. There was a great divergence of opinion as to how far water-works were responsible under the new Act. The Directors had decided to be their own insurers—for a time, at any rate. Mr. Asquith had given the opinion that pumping-stations did not come under the Act. The motion was carried unanimously; and the dividend recommended was approved.

The Price of Gas in Nottingham.—Gas in Nottingham in 1820 was 12s. per 1000 cubic feet; in 1830, the price had been reduced to 10s.; in 1840, it was 7s. 6d.; in 1850, just half that price, 3s. 9d.; in 1860, it was 3s. 0½d.; in 1870, 2s. 9d. There has practically been no change in the price of gas since 1882. It was then 2s. 6d. and 2s. 4d. per 1000 cubic feet; and the variations have been only slight and temporary.

Kirkby Stephen Water Supply.—Yesterday week the East Westmorland Rural District Council negatived a proposal to apply for borrowing powers for £800 for works of water supply at Kirkby Stephen. By a small majority, it was decided to consult an expert water engineer before proceeding further with the scheme. For several years the existing supply, which was originally in excess of requirements, has failed to deliver anything like the quantity of water needed for the district.

New Works for the Tuxford Gas Company.—The Tuxford Gas Company, who obtained parliamentary powers last year, have decided to abandon their old gas-works, which have become too small for present requirements, and build new ones on modern lines. A site has been selected adjoining the Great Northern Railway, and new works have been designed by Mr. Arthur Graham, of Mansfield, the Company's Engineer. The contract for building them and laying the mains throughout the district has been let to Messrs. R. Dempster and Sons, Limited, of Elland, who, it is expected, will have the works ready to meet the coming winter's requirements.

Village Water Supply.—Mr. M. Biddulph, M.P., has lately contributed to the solution of the question of water supply to rural communities. The villages of Toulton and Rodmarton, on his estate near Cirencester, stand high on the oolite. These villages, which together have a population of 500 or 600, do not possess any local wells or springs, and until quite lately both farmers and cottagers had to fetch their supplies from a well more than a mile distant. Deciding that, instead of having to fetch their water these people should have the water carried to them, Mr. Biddulph has established water-works, at a cost of something like £1300, which convey the water into the midst of the two villages. The chief features of the works are a pump, operated by an oil-engine at the before-mentioned well, some miles of 3-inch iron pipes, and an elevated tank holding about 3000 gallons in the village of Toulton. Both farmers and cottagers are delighted with the new arrangement, for the benefit of which the former pay £10 to £12 per annum and the latter the nominal sum of ½d. per week.

The New Works of the Newcastle and Gateshead Water Company.—On Friday, the 19th inst., the members of the Gas and Water Committee of the Newcastle Corporation inspected the new works of the Newcastle and Gateshead Water Company at Catcleugh. On arriving, the visitors were shown over the works by the Secretary and Manager of the Company (Mr. G. Smith) and the Resident Engineer (Mr. Henzell). During the tour of inspection, an exceedingly interesting function took place, the Chairman of the Committee (Mr. Riley Lord), at the request of the Secretary of the Company, placing in position the last brick in the first junction of the tunnel which is being constructed underneath the new reservoir. In the course of a few remarks, Mr. Lord wished the Company every success in their huge undertaking. When the reservoir was completed, he thought they would all agree there would be ample provision for a sufficient supply of pure water to the city for, at any rate, another quarter of a century. On behalf of the Committee, he very heartily thanked the Directors of the Company, Mr. Smith, and Mr. Henzell for their courteous reception of the representatives of the City Council and their description of the great works now in progress. It may be added that the reservoir will cover an area of 270 acres, and will be capable of storing about 2000 million gallons of water. The present storage capacity is 3060 millions.

ELECTRIC LIGHTING NOTES.

The Local Government Board have sanctioned the borrowing of £29,850 by the Coventry City Council for electric lighting purposes.

The Worksop Urban District Council resolved last week to apply for a Provisional Order under the Electric Lighting Act. So far they are committing the townspeople to an expenditure of about £200 only—being the estimated cost of obtaining the Order; but, in the event of the Order being secured, some £10,000 would need to be spent on an electric lighting scheme adequate for the place.

Professor Kennedy has lately presented to the Lighting Committee of the Grimsby Corporation a report upon the lighting of the town by electricity. In the course thereof he stated that a well-conducted municipal electrical undertaking might now be considered as certain of success, both from the technical and financial points of view. This was the case even where it was only proposed to supply current for lighting purposes; whereas in Grimsby they also expected to be able to furnish it to the Tramway Company for power. Therefore success was still more certain. The estimated cost was put down at £35,000; but in view of contingencies, slight alterations, and extensions, it was advised that £40,000 should be applied for as the probable capital expenditure. He recommended the use of the continuous current three-wire system. It was assumed that within a year or two of the opening of the station there would be a total of about 9000 lamps of 8-candle power, or their equivalent, connected to the mains; but of these not more than 5000 would be alight at once. The total capacity of the plant to be put down in the station, including reserves, would be about 750-horse power. Separate mains would be required for tram lines. A route was mapped out in the report for public lighting by electricity. Professor Kennedy did not consider it would be worth the while to supply electricity to the docks. The Corporation have adopted the report.

The Vestry Clerk of Hampstead (Mr. A. P. Johnson) has issued a report on the working of the Vestry's Electric Light Department for the year ending March last. He is evidently delighted with the state of things, for he says "the Vestry has now under its control a most important and highly remunerative branch of administration, such as must undoubtedly prove itself a source of gratification to the Vestry which has conducted its development, and an inestimable boon to the ratepayers generally." Under these circumstances, therefore, it seems rather churlish to make any depreciatory remarks, but it should be noted that this scheme has now absorbed £100,176—£35,000 from the London County Council, and £24,400 from the Prudential Insurance Company, while £37,000 odd is "balance due to Treasurer" (*i.e.*, overdraft at the bank). This enormous capital earned during the year under review the fabulous profit of £3905—not quite 4 per cent. Nothing appears to have been set aside for depreciation. The Vestry Clerk is of opinion that "of course there is every reason to hope for and anticipate even larger profits in future years." Apart from this financial aspect, the undertaking is progressing, as with such monetary backing it is bound to do. The gross income was £15,930, as against £13,426 the previous year; while the trade expenditure has slightly decreased. There were 840,002 units generated; but 172,075 are not accounted for. There are 24 public lamps.

A conference took place last Thursday between representatives of the Parliamentary Committee of the Leeds Corporation and the Directors of the Yorkshire House-to-House Electric Supply Company, in reference to the purchase by the City Council of the undertaking of the Company. There was, says the "Yorkshire Post," a very long but friendly discussion, resulting in an agreement being arrived at, which will be elaborated and signed in due course. It will first provide that the capital expenditure from which the Company shall benefit is to cease on the 1st prox. From that date all capital expenditure will be for and on behalf of the Corporation. The second provision is that the Company shall receive all the earnings up to the same date, and the Company will only begin to receive interest on any unpaid purchase money from Oct. 1. The date definitely fixed for handing over Corporation scrip and cash to the Company in payment for their concern is Nov. 15. The worth of the stores is to be ascertained by valuation; the Corporation and the Company each appointing a valuer. It is further provided in the agreement that the Corporation shall take and pay for the book debts, which are to be guaranteed by the Company. The Corporation will take over contracts, way-leaves, and other matters. In regard to the purchase-money, the Corporation have already obtained parliamentary sanction to the issuing of 5 per cent. irredeemable stock for the amount properly expended on capital account and cash for book-debts, stores, &c.

The Newbury Town Council, as intimated in a paragraph which appeared last week, will not have the electric light installed in the town. This decision was come to at their last quarterly meeting. The discussion on the question was initiated by the presentation of a report by the Gas Committee, who had been informed that notices from the Great Western Electric Light and Power Company, Limited, and the United Electric Light and Traction Company had been received by the Town Clerk, intimating the intention of these Companies to apply to the Board of Trade for Provisional Orders authorizing the supply of electricity for public and private purposes within the borough. Subsequently an interview had taken place between Mr. George Offor, the Secretary of the Municipal Electric Supply Company (who is also Secretary of the Great Western Electric Light and Power Company, Limited), and the Chairman of the Committee, and the Town Clerk, with reference to the notice received from the latter Company. As a result of this interview a letter had been received from Mr. Offor, which said: "My Company is prepared to take a lease of your Provisional Order upon the terms that at the end of ten years (and at any time thereafter), by giving two years' notice, the Council shall be entitled to purchase the entire undertaking and goodwill at a valuation by independent valuers; or, as alternative terms, the Council may have the option, at the end of seven years and up to fifteen years, of purchasing on the basis of capital expenditure, *plus* 6s. 8d. in the pound thereon, or at any time after the works are started, by issuing to the Company bonds or stock of the Local Authority of such an amount, having regard to the rate of interest on such bonds or stock, as will secure to the Company an amount equal to 5 per cent. per annum upon such capital expenditure—the said bonds being redeemable at par at the expiration of 21 years from date of issue." The Committee, after careful consideration, did not see their way to recommend the Council to accept the terms.

THE DRY WEATHER AND WATER SUPPLY.

The Curtailment of Supply at the East-End—Other Districts Affected.

Although the notice given by the Secretary of the East London Water Company (Mr. I. A. Crookenden), on the 18th inst., that, owing to the present severe and continuous drought, the Company would be compelled to suspend the constant supply of water on the following Monday, and substitute a service for two periods of three hours each day, aroused a good deal of excitement in their district, which is about 80 square miles in extent, and has a population of nearly 1,300,000 persons, there were no striking signs of the so-called "water famine" on the first day on which the changed conditions came into operation; and inquiries made in various places elicited the singular fact that some at least of the inhabitants were not aware of any restriction in the supply. In no part of the area was the water shut off till six o'clock on Monday morning; while in some of the Whitechapel, St. George's-in-the-East, Poplar, and Stepney districts it was on till noon, and again at six in the evening. The streets were watered as usual, and the factories and numerous stable-yards had their full supply; and, save for the presence of stand-pipes in some of the bye-streets near the City, things presented very much their usual appearance. The action of the Company which has been so generally criticized adversely was a measure of precaution adopted to check reckless use—not to say waste—of water at a time when meteorological conditions are unfavourable to the replenishment of the stores; but, even with the restricted supply, the consumers are furnished, on an average, with 24 gallons per head daily, or a total of 31 million gallons. In the week ending the 20th inst., the daily quantity was 46 millions; and in the preceding week, 44 millions. The quantity in store on Monday morning last week was 169 million gallons, or about one-seventh of the water available when the reservoirs are full; and, unless the season changes rapidly, there are fully six weeks of short supply to be faced. Of course, where storage cisterns exist, the inconvenience of an intermittent supply will scarcely be felt; and arrangements have been made whereby the poorer classes will, as on previous occasions, be furnished with suitable receptacles for the water while it is available.

A special meeting of the General Purposes Committee of the Hackney Vestry was held on Monday night last week, at the Hackney Town Hall, to consider the Company's notice. Mr. J. W. Whiter presided, and, contrary to the usual practice, representatives of the Press were admitted. Mr. Hasemer suggested that road watering should be stopped at once, and that the water-carts should be sent round to the poorer districts which had no storage accommodation. Mr. Sheehan said he thought the Vestry should buy water from the New River Company for watering the roads and for the supply of the poorer districts when the water was not on, and that the cost should be charged to the East London Company. The Chairman, after a long discussion, suggested that a Sub-Committee should be appointed to wait on the officials of the Company and obtain their consent in writing to be responsible for any expense to which the Vestry might be put in supplying those districts which were without storage accommodation. Mr. Mate opposed the suggestion not to water the roads; adding that the Company had erected stand-pipes in the poor districts that morning. Ultimately the Sub-Committee was appointed.

The General Purposes Committee had another meeting on the following night, under the presidency of Mr. Whiter. He stated that the Sub-Committee had that day waited upon the Company's Engineer (Mr. W. B. Bryan) at the Company's offices; and a transcript of the shorthand writer's notes taken at the interview was read. From these it was gathered that Mr. Bryan would recommend the Directors to adopt the course they took during the short supply in 1896—namely, to agree to pay the expenses the Vestry were put to in supplying water to the poorer districts by water-carts during the time the water was turned off. The Company would also undertake to supply jars and pans for the storage of water, 200 of which would be ready for delivery the following morning. Mr. Bryan also undertook to send to Mr. Grocott, the Vestry Clerk, a time table of the hours that the water would be on and off in each district, and to consider the case of hospitals and Board schools which had no storage supply.

He made the following statement as to the cause of the present short supply of water: "In the last twelve months the rainfall has been worse than it has been for many years—something under 15 inches. The average at our rain-gauge stations has been 14·85 inches. The River Lea has been flowing at a lower level than has been known for years. The experience of 1895-6 proved that all the experience of sixty years was not safe; the consequence being that we went to Parliament and got our Bill through last session. This experience will necessitate the Company looking farther afield to extend their works. The New River Company take 22½ million gallons per day from the Lea before we can take a drop. Notwithstanding this, the Company have never given so good a supply to their district as they have done this year." Mr. Whiter said: "You find the necessities of life require more water per head than formerly;" and Mr. Bryan replied in the affirmative. As a result of this interview, the Committee decided to send out 12 water-carts the next morning. They further directed that 1000 notices to the following effect should be posted in the part of the parish served by the Company: "Water.—The East London Water-Works Company have empowered the Hackney Vestry to send to the doors of the consumers water to be delivered free by means of water-carts during the hours that the water is turned off. Any person failing to secure a supply is requested to communicate in writing with the Vestry at the Town Hall, Mare Street, when the matter will receive immediate attention. No money for water from the carts should in any case be given. By order, George Grocott, Vestry Clerk." The Committee also undertook to personally visit the affected districts, and see that the arrangements were properly carried out.

Although the short supply of water caused considerable inconvenience in the poorer parts of Hackney, not a single complaint was received at the Town Hall last Tuesday. In streets where no storage accommodation exists, stand-pipes were erected, and the people were thus enabled to help themselves from the main. Inquiries at the public baths in the district showed that they had not experienced any lack of water; neither had the large manufactories and the private houses which are supplied

by meter. The explanation of this is that those consumers who pay by meter are supplied from the fire-mains, which are always kept charged. A letter appeared in "The Times" on Wednesday, signed by twelve medical men practising in Ilford, calling attention to the great dangers attending the curtailment of the water supply, especially in cases of diarrhœa. The writers of the letter went so far as to say that, as the proportion of these cases would enormously increase under the new conditions, the stoppage of the water would be as directly the cause of any deaths that might occur "as if the patients had been actually poisoned." They advised the interference of Parliament.

Last Wednesday there were many more signs of the trouble in connection with the water supply than had been previously noticeable. The twelve water-carts of the Hackney Vestry, each bearing the inscription, "Water Free. No Gratuities Allowed," started in the morning, and did good service. Other Local Authorities prepared to follow the lead of the Vestry in this method of distribution; and the officials of the Company assured the Corporation of West Ham, a deputation from which had waited upon Mr. Bryan, that they would reimburse any of them for the expense. Another point in which the Company assisted the Local Authorities was in the distribution of suitable storage vessels. A supply of two-gallon jars was sent to Hackney; and other authorities were to have them. The officials of the Company and of the Health Authorities, therefore, were doing all in their power to mitigate the existing trouble, and remove sources of possible danger. The Official Water Examiner for the Metropolis (Major-General A. de Courcy Scott) had a prolonged interview with Mr. Bryan on Wednesday. The latter explained all that had been done and all that was contemplated by the Company to alleviate the present trouble. The proposed distribution of storage vessels was especially welcomed; and a very satisfactory feature of the interview was that in which Mr. Bryan reported that he had ordered for immediate delivery another 5000 two-gallon jars. This would materially lessen the danger which would otherwise have arisen from imperfect and inconvenient storage in the crowded dwellings of the poorer districts.

The experience of the first three days of the intermittent supply was less satisfactory than had been wished. The estimate made by Mr. Bryan as to the effect of the reduction of the output of water to six hours was that he would save 14 to 15 million gallons per day. In the first two days, however, he only saved 8½ million gallons per day. The reason of this may possibly be found in a letter which appeared in "The Times" on Thursday. The writer said: "Judging by my personal observation, I am inclined to think that the present system [of intermittent supply] leads to much needless waste of water. To take my own case as an instance, the water was turned on early this [Wednesday] morning, and all the water remaining in kettles, jugs, &c., was promptly poured out and used for flushing purposes, or for watering the garden. Kettles, saucepans, and a large tub were then filled, and a store of perhaps 50 gallons thus put by; for we cannot be sure that we shall get any more until to-morrow. If, however, the water is turned on again this afternoon, all that is left of this morning's supply, or a very considerable part of it, will be used to flush the drains, and a fresh supply of water will then be laid in. In the ordinary course, we probably use about 30 gallons of water per day; while the East London Water Company pursue their present insane policy, we shall probably use, or waste, quite double that quantity. Nor are we alone in thus acting. All our neighbours, so far as I can see, do the same. I do not think that anybody but a water-works official will be found to blame them. While the constant supply for which we have paid is provided, the water is drawn as required, and is not wasted. While, however, it is turned off during the greater part of the day, we have, when the opportunity is given, to draw sufficient water to last perhaps for 12, possibly for 24, hours. We take enough to meet all possible requirements for 24 hours. The water gets warm and dusty; and when a fresh supply is provided, we naturally prefer to have clean fresh water, so the standing water is thrown away. I assure you that this is what is being done all over the East-end; and it will continue until the East London Water Company decide to carry out their contracts with their customers."

The General Purposes Committee of the Hackney Vestry met again on Wednesday evening, when a discussion was raised as to the advisability of continuing the watering of the roads. The Chairman (Mr. Whiter) said he was assured by the Company's Engineer that this was a small matter, and would not affect the supply. Mr. Chambers said he had spent the afternoon at the Company's reservoirs. He was informed that the average depth of water was 4 feet; but that it would be impossible to utilize this water, as the level was below the conduits which took it into the Company's mains. The reservoirs were teeming with fish; and a very great danger would arise if these died. This state of things applied to five of the reservoirs; and before the water in them could be used, steam-engines would have to be erected on the banks to pump the water out. He was inclined to the opinion that, after seeing the reservoirs, the Committee would stop the watering of the roads as a public necessity. Mr. Boulton, an official of the Vestry, who had been deputed to inquire into complaints, said he had visited a number of the streets which were affected during the last drought, and had found only one jar which was supplied on that occasion. Many people complained that, although they could get water, they had nothing to store it in. The Committee decided to proceed at once with the distribution of jars and pans.

The Directors of the Company held a meeting last Thursday—Mr. G. Banbury in the chair. Mr. Bryan made a detailed statement of the arrangements he had made on behalf of the directorate with various local bodies, including the Hackney Vestry and the West Ham Town Council. He also stated that the direct saving of water due to the limitation of the supply had amounted to some 18 million gallons, which was much less than he had estimated. The Company had received offers of assistance and co-operation from various Local Authorities, and plans had been suggested for the relief of the poorer inhabitants of certain districts in which the supply of water was restricted. In some instances the suggested methods of relief had already been adopted, and water-carts had been sent out to distribute water to all those applying for it. A large number of earthenware jars had been distributed; and many more had been ordered. The stand-pipes that had been erected had proved invaluable; waste of water from these being prevented by the Company's officials who were in charge of them. He asked the Directors to give their assent to the arrangements made in their name, and to confirm his promise that the Local Authorities should be reimbursed for all expenses they had incurred in assisting the inhabitants of their respective districts. The Directors sanctioned the outlay proposed by the Engineer, and approved of the arrangements made by him. They agreed to reimburse the Local Authorities, and passed a resolution to the effect that "every effort would continue to be made to mitigate the inconvenience caused by the cessation of the usual constant supply, and to co-operate in every possible way with the efforts being made by the Local Authorities to achieve this purpose." They also agreed to continue to purchase all the water that could be spared by the New River Company, as well as any further supply obtainable from other Companies. The Directors expressed their gratitude for the offers of assistance made to the Company. It was officially stated last Thursday that for the 24 hours ending 6 a.m. on the previous morning, the total quantity of water sent into the Company's area represented 26 gallons per head of the population. The amount withdrawn from the storage reservoir at Walthamstow was 6 million gallons. Mr. Bryan said that the Company could not obtain more water than they were now purchasing from the New River Company. If an attempt were made to get water from the mains of the Grand Junction Company, the result would be that the water in the East London Company's mains would force the Grand Junction water back, and would itself flow into the latter Company's pipes.

The General Purposes Committee of the Hackney Vestry met again on Thursday night, and were engaged for some hours in settling details with regard to the work of the officials in coping with the inconvenience caused by the shortened water supply. The Chairman (Mr. Whiter) said the inquiries of the road surveyors and the sanitary inspectors showed that at least 2000 jars would be necessary to supply the poorer districts of Hackney with the means of storing water. It was decided to write to the Water Company to this effect. The Company had delivered a further consignment of jars that afternoon; and up to six o'clock that evening 280 had been distributed. Twenty water-carts had been at work, and 15,000 gallons of water had been distributed free. Mr. Whiter added that during the day Dr. Bruce Low, one of the Medical Inspectors of the Local Government Board, had been in the district making inquiries and taking notes for the use of the Board. The Doctor had expressed satisfaction with the action the Vestry had taken to meet the difficulty.

The Hackney Vestry met again on Friday night to further consider the position of affairs. The report of the General Purposes Committee, embodying a statement of facts as to what has already been done by the Hackney Authorities, was received and approved. Mr. J. Whiter, the Chairman of the Committee, said the Vestry's water-carts had up to five o'clock that evening furnished 43,200 gallons of water in the poorer districts. The Vestry had also distributed 583 jars. He moved that the Company's letter announcing the curtailment of the supply should be referred to a Joint Committee of the Public Health Committee and the General Purposes Committee, to take whatever action might be deemed necessary. On this Mr. Cohen moved—"That, in accordance with the Metropolis Water Act, 1897, 60 & 61 Vict., cap. 56, sec. 2, this Vestry make an immediate appeal to the Railway and Canal Commissioners to hear and determine the complaint of this Vestry in regard to the present inadequate water supply in East London, and to urge upon the Commission to take immediate action to remove such ground of complaint, seeing that the health of a million and a quarter of inhabitants is imperilled thereby." Mr. J. B. Holmes seconded the motion. Mr. Wiltshire suggested that Hackney should not undertake the whole of the responsibility of bringing the matter before the Railway Commission. Mr. Whiter supported the proposed combination of the different parishes, as he was convinced that a strong combination would be necessary to fight the vested interest which the Water Company possessed. Personally, he was strongly in favour of a municipal supply. Ultimately, Mr. Wiltshire's proposition was rejected, and Mr. Cohen's motion was carried, as was also that of Mr. Whiter, that the Company's letter should be referred to the Joint Committee of the General Purposes and Public Health Committees. Mr. Whiter said this placed him in a rather difficult position, as he felt sure that one of the first acts of the Joint Committee would be to seek the support of the other local bodies. He added that the complaint of the Vestry would be embodied in a formal document, and sent to the Commission at once.

Mr. G. Grocott, the Vestry Clerk of Hackney, stated to Dr. Bruce Low, who called upon him to ascertain the position of affairs in the district, that no complaints had been received, owing probably to the prompt action of the General Purposes Committee. Mr. Grocott waited upon Mr. Bryan on Friday morning, and laid before him the report of the Vestry's officials with regard to the Board Schools in the districts where no water was to be obtained in the outside lavatories and at the yard fountains during school hours. Mr. Bryan promised that this state of things should be remedied if possible. He added that the Company had ordered 8000 jars for distribution for storage purposes, and that they would be sent to the Local Authorities as soon as the manufacturers delivered them. In the evening, it was officially stated by the Company that but few complaints of the intermittent supply, of a personal character, had been received, and that what few there were came from persons using water for steam-raising purposes, whose tanks were not sufficiently capacious to store the needful quantity. A connection had been made between the mains of the Company and those of the Kent Company, by means of pipes running through the Blackwall Tunnel. The quantity supplied in this way was not large; but it was a highly useful auxiliary.

Last Saturday it was stated at the offices of the Water Company that the outflow from the reservoirs on the previous day had reached 30 million gallons—an amount which encroached very slightly on the reserve supply the reservoirs had contained since the constant service was discontinued. A connection with the Kent Water Company's mains in the River Thames at Blackwall had been effected, and upwards of 500,000 gallons of water had been pumped into the East London Company's mains. The pumping operations were being carried out both night and day, with the result that a portion of the district of Poplar was again enjoying a full 24 hours' service. The officials considered it was highly probable that several other streets would, in the course of a few days, be again put on the constant system. A further consignment of 2000 earthenware jars was despatched from the Company's works at Lea Bridge to several of the parishes, including St. George's-in-the-East, Poplar, Limehouse, and Hackney, for distribution among those persons

who did not possess the necessary utensils for storing the water when turned on. The Directors, acting on the advice of Mr. Bryan, placed a further order for an additional supply of 8000 jars, with instructions for them to be delivered immediately.

The provision of means of storing the water while it is on seems, notwithstanding many statements to the contrary, to be the best means of mitigating the inconvenience entailed upon the poorer classes by the restriction of the supply; and the promptitude with which the Company took steps to distribute earthenware jars deserves commendation as well as simple recognition. If the vessels supplied to the consumers on the occasion of the previous trouble had been preserved, they would have been again available. But the Inspectors of the Hackney Vestry found very few of them were in existence. It is beginning to be recognized that in such a crisis as the present it is wiser to assist the consumers in preserving the water supplied to them than to abuse the Company for taking a judicious step forced upon them by exceptional meteorological conditions; and one of the London evening papers has put down £100 as the basis of a fund, to which contributions are invited, for supplying three-gallon jars to the poorer classes. They are to be distributed from centres under the control of persons intimately acquainted with the needs of the various districts. The truth is that most of the present trouble arises from the abolition of the house cistern. A correspondent of the "Standard" suggests that cisterns should invariably be provided for the storage of water for ordinary domestic purposes—for cleansing, and for the flushing of water-closets by means of water-waste preventers of 3 gallons capacity. But water for potable use should be obtained direct from the main, without the intervention of cisterns, by means of a tap affixed to the house service-pipe. He says: "The quantity of water now supplied, in six hours, by the East London Company—24 gallons per head daily—is reasonably sufficient for all purposes and occasions, could it be properly utilized. Subject to the provision of cisterns, this quantity would probably even allow of the continuance of constant supply. I remember the time when in the West-end water was turned on for less than an hour once daily. But every house being provided with more or less adequate cisternage, the supply was ample. Take away the cisterns, and the 'famine' would probably be general. Restore to East London the means of domestic storage, and enforce the provisions of law against wilful waste, and we should then hear little more of 'water famines' in that district." Mr. George Kebbell, writing to the same paper, shows how recklessly the Company's water is wasted. He says: "There can be no question that, if the consumers would use due care, no difficulty in giving a good supply could arise even in a period of drought such as the present. You cannot possibly get a sufficient quantity of water if two or three of your neighbours are wasting it at the rate of (say) 50 or 60 gallons an hour. Waste is at the root of it all. I can speak with some experience; and this waste, particularly in the East-end, arises in several ways. There is the man who wastes 40 gallons an hour sooner than spend eighteenpence to have his tap repaired. There is the gentleman—generally the Polish Jew in Whitechapel—who washes his clothes by putting them in the sink, and letting the water run on them all night. Again, there is the consumer who leaves the tap open all through the 24 hours to 'flush his drains;' and, lastly, there is the criminal, who, from sheer devilry, lets his water run full bore to waste. You cannot eat your cake and have it as well. 'Waste not, want not.'"

As mentioned in the "JOURNAL" last week, the East-end of London is by no means the only place where it has been necessary to restrict the water supply. A short time ago, the Manager of the Maidstone Water Company (Mr. W. J. Ware) sent out a notice that, on and from the 18th inst., the water supply would be suspended daily from 7 p.m till 6 a.m. This action on the part of the Company naturally caused some misgiving in the public mind; but an assurance has been given that there is no reason whatever to anticipate a "water famine." The supply available to Maidstone now is nearly as large as at any previous time since the suspension of the Farleigh springs. The drought has, of course, slightly reduced the yield of water at Cossington, Boarley, and elsewhere; but this is not the real ground on which the Directors of the Water Company have decided to cut off the town's supply between the hours above mentioned. As is the case in the East London Company's district, it is found that during the hot weather people are accustomed in the evening to water their gardens with a very free hand. This puts an extra strain on the Company's supply to which it is not equal under present conditions; and the Directors had no course open to them but to suspend service at the hour when garden watering usually commences. The Mayor of the borough (Mr. J. Barker) stated to a Press representative, on Monday last week, that he did not believe there was any cause for alarm in the town. He acknowledged that there was a scarcity of water; but there was no danger of anything like a "famine." It was only necessary that people should be economical. At the present time there were, he said, 3000 persons outside the borough drinking water from one of the springs at Farleigh which were cut off during the typhoid epidemic last year on the recommendation of the Medical Officer of Health (Mr. M. A. Adams). Ewell spring was not one of those which were proved to be contaminated; and the Town Council were about to consider the advisability of asking the Water Company to restore the supply derived from it. He was satisfied that the Company could not increase their supply by taking additional water from the Mid-Kent Company. At present the Maidstone Company could only get about 3000 gallons per hour from their neighbours, or a total of 60,000 or 70,000 gallons per day; whereas they originally guaranteed 100,000 gallons per day. At a meeting of the Council in Committee on Wednesday, the question of supplementing the water supply of the borough was discussed at considerable length; a proposal being put forward to the effect that the Water Company should be asked to revert to the use of certain of their Farleigh springs, said to be capable of yielding some 2 million gallons of water per week. In view of the fact that the typhoid epidemic of last year originated from the Farleigh water, and that the whole of the springs were more or less condemned by experts, the proposal raised an angry protest; and the opinion was expressed that a riot would ensue if any portion of the suspected supply were restored. The opposition was strengthened by the report of the Medical Officer of Health in regard to certain samples of the water now under examination. One of these samples he had no hesitation in saying was very bad. Looking to what occurred last year, and bearing in mind that the whole of the Farleigh water was derived from surface springs, it was impossible not to regard it with suspicion. Eventually a resolution was passed that the Ewell water should not again be turned on for the use of the town; a rider being added requesting the inhabitants of the borough to use their best endeavours to prevent any waste of the present supply. One or two members of the Council contended that the Water Company could further augment the quantity of water at their command by entering into an agreement with the Mid-Kent Company, which up to the present they had declined to do. On behalf of the Company, it was pleaded that they were already taking all the water their neighbours could supply. Not being satisfied with this assurance, the Council appointed a deputation to meet the Chairman and Directors of the Mid-Kent Company on the subject.

The Water Committee of the Bury St. Edmunds Corporation a few days ago issued a notice to the consumers to the effect that, in consequence of the continued drought, and the possibility of a greatly reduced supply, they had instructed their Engineer to turn off the water from the town mains between the hours of 11.30 p.m. and 5 a.m. At the same time, they prohibited the use of water for garden-hose and fountains. Ample provision, however, would be made for fire extinguishing; and the Committee expressed the hope that the initial steps they had taken would enable them to continue the supply without much inconvenience to the consumers, whose co-operation they invited in endeavouring to check all waste and misuse of water. The new regulations came into force last Thursday.

Last Wednesday, the South Essex Water Company notified to their consumers that the supply would have to be reduced during the continuance of the drought. This notice will affect what is known as the Metropolitan area of Essex.

At Stopsley—a village of nearly 800 inhabitants, about two miles from Luton—the residents have been for the past month practically without a supply of water. The public well, which is some 200 feet deep, has become dry, owing to the drought; and in consequence the villagers have had to go begging for water from their neighbours. Arrangements have been made for a supply from the Luton Water Company, whose mains extend to within a mile of the village; and water is being distributed by carts at ½d. per pailful. The supply in several other villages is running short. At Battle, the great falling off in the yield of water at the works—the quantity being only 4000 gallons per day—caused the Urban District Council some anxiety at their meeting last Thursday, when a report on the matter was presented. It was decided to seek the assistance of Mr. Palmer, of Hastings, in obtaining a proper supply of water.

On the other side of the Channel, the water supply is being affected by the recent excessive heat combined with the drought. The supply of spring water is giving out in Paris, and last Thursday the Seine water was turned on in three *arrondissements*. It appears that notwithstanding the large amounts spent some years ago to supply the city with the pure water of the Avre, in addition to that the inhabitants already received from the Dhuys and the Vanne, the reservoirs are almost empty. As may be imagined, says the correspondent of the "Standard," the prospect of having to drink the unwholesome waters of the Marne and the Seine was not contemplated with perfect equanimity by the Parisians. Nevertheless the "Temps" tries to console them by declaring that the Seine water would be well filtered, and that it was, in reality, just as healthy as that of the Vanne, the Dhuys, or the Avre. The only difference is said to be in the temperature. That of the last-named three rivers varies between 51° and 53° Fahr.; whereas the Seine and the Marne is about 68° or 70°.

THE EPIDEMIC OF TYPHOID FEVER AT MAIDSTONE.

[The Report to the Local Government Board.

The report of Mr. J. S. Davy, Dr. Thomson, and Mr. G. W. Willcocks, the Local Government Board Inspectors, with reference to the Maidstone typhoid epidemic of 1897, was received at Maidstone last Friday. The inquiry was opened at the Sessions House, Maidstone, on Jan. 31, and continued for eight days. The epidemic began in September of last year, and extended over three or four months. Up to Jan. 20, 1898, there had been a total of 1681 cases in the borough, excluding 107 notifications by the Kent County Lunatic Asylum at Barming. There were also 20 cases in the Maidstone Union Workhouse, which is situated outside the borough; and, in addition, a number of persons were attacked in rural parishes adjoining Maidstone, and supplied with water by the Maidstone Water Company.

After sketching in great detail the history of the epidemic, the Commissioners state in their concluding comments: "On a review of the whole of the epidemic, we have no hesitation in coming to the conclusion that the epidemic was caused by the pollution of the water supplied by the Maidstone Company from their Farleigh sources. It is true that there is abundant testimony to show that grave sanitary defects exist in the construction of some of the sewers and of many house drains and water-closets within the borough; while one of the expert witnesses, Dr. Corfield, said that, in his opinion, these defects were sufficient to account for the epidemic. But the sudden and simultaneous outbreak of fever over a wide area, and the rapidity with which the epidemic grew, cannot be accounted for by the existence of defective conditions of sewerage and drainage. Further, the facts as to the local incidence of the disease are not consistent with the theory that these conditions had anything to do with its origin. The old brick barrel sewers are almost all in the lower part of the town, which was comparatively free from attack, and the hand-flushed and defective house drains are distributed pretty equally over the whole town; whereas the cases of typhoid fever were confined to the Farleigh area of water supply to an extent which quite precludes the possibility of mere chance."

Dealing with the contention of the Water Company that many of the typhoid cases were wrongly attributed to the Farleigh water supply, the Commissioners say: "We are of opinion that many of the typhoid cases in the borough were due to defects of drainage and sewerage, with consequent pollution of the soil underlying the town. The responsibility for the existence of these insanitary conditions lies with the Town Council, whose duty it was to take steps that would lead to effective remedy of

these defects. This duty they have in large measure neglected, notwithstanding that for many years the Medical Officer of Health has repeatedly warned them of the risk to which the inhabitants of the town were exposed by the continuance of these insanitary conditions."

Concluding their report, the Commissioners state: "The history of the epidemic appears to us to raise the question as to how far the regulations of the Board relating to the duties of Medical Officers of Health and the statutes which regulate the powers and obligations of private water companies are sufficient to ensure a reasonable amount of protection to the public health. The General Order of the Board of 1891 prescribes that the Medical Officer of Health 'shall inform himself as far as may be practicable respecting all influences affecting or threatening to affect injuriously the public health within the district.' This regulation might be held to make it the duty of the Medical Officer to visit and inspect the works of a private water company supplying water to his district, even though the works were situate outside it, as is the case at Maidstone. This, however, was not the construction put upon the regulation by Mr. M. A. Adams, the Medical Officer for Maidstone; and, as a matter of fact, he had never seen the sources of the water supply furnished to the Farleigh area. He pointed out with considerable force that he had no legal right of access to the works, or to take samples of the water. Yet section 7 of the Public Health (Water) Act, 1878, imposes upon rural sanitary authorities the duty of taking such steps as may be necessary to ascertain the condition of the water supply within their district. It must be stated, however, that it did not appear that any application to inspect the works or to take samples of the springs separately was ever made to the Directors of the Water Company by either of the Sanitary Authorities concerned."

NOTTINGHAM CORPORATION WATER SUPPLY.

The Water Committee's Annual Report.

From the annual report of the Water Committee of the Nottingham Corporation for the year ending March 31, which will be presented at the next meeting of the City Council, it appears that the revenue has been £2607 more, and the expenditure £2495 more than in the previous year; the latter increase being caused by additional distribution expenses, interest on loans, &c. After paying annuities, interest on loans and consolidated stock, and the annual contributions to the renewal fund and the different sinking funds, there is an ultimate balance of profits amounting to £4243, which the Committee have carried forward to the new account called the "additional works account," which was established in 1896 to provide for the estimated expenses incurred in seeking further supplies of water. The profit and loss account shows that water-rents brought in £72,556; while £126 was paid by the public in fees for the testing of water-fittings. The total revenue of the department for the year amounted to £74,424. On the other side, the net expenditure was £69,681, of which £27,808 was absorbed by working expenses, £1969 by empties and collectable and non-collectable arrears of water-rents, £35,125 by interest on stock, annuities, &c., and £4777 by the annual instalments to the sinking fund. The repairs and maintenance of machinery, general stock, and buildings came altogether to £6929, which was divided as follows among the various water-works owned by the Corporation: Park works, £279; Basford works, £2305; Bestwood works, £2051; the Papplewick works, £2294. The capital account shows that £1518 has been expended upon the new works at Boughton.

PUDSEY AND ITS WATER SUPPLY.

An Incorporation Proposal.

An inquiry into the application of the inhabitants of Pudsey for incorporation occupied the attention of Mr. C. N. Cresswell, from the Privy Council Office, for two whole days last week; and from the eminent standing of some of the learned Counsel engaged in representing various interests supposed to be affected by the proposal, more than appeared on the surface was really involved in the proceedings. As a matter of fact, as pointed out by the "Bradford Observer," the attitude of the various parties throws an interesting light upon the relationship of the large and prosperous communities which within a radius of some ten or twelve miles from the town of Leeds threaten in the long run to cover every available inch of land with buildings, and obliterate all natural dividing lines. Pudsey desires incorporation in order to keep out of the clutches of Bradford and Leeds (between whom it stands like a buffer state), and from a desire to gain the higher status. The West Riding County Council support the application, because if Bradford—with the jurisdiction of a county borough—swallows up Pudsey, the district disappears for all practical purposes from the area of the county; while the separate incorporation of Pudsey as a borough of the ordinary status would make no material difference. Leeds supports the application because it has not only an eye on Bradford and its extension, but another on the possibility of supplying Pudsey with water after the year 1913, when the agreement with Bradford will expire. Bradford alone opposes the project of the Pudsey people; and the reasons for its opposition are very tangible. For many years—during which Bradford has been moving in municipal matters at a pace which entitled it to some distinction as a pioneer—it provided itself with gas, water, market rights, hospitals, libraries, and other equipment which have put its inhabitants to very great expense, and the privileges of which are largely shared by the people of surrounding townships such as Pudsey. And now the City Authorities naturally have a great objection to any of these surrounding places escaping from such financial responsibility as can be put upon them in respect to these matters. The Bradford Corporation undertook to provide Pudsey with water, and—as was disclosed at the inquiry, apparently to the astonishment of all the other parties—can be compelled to do this, and even to put down pipes in the streets if necessary. It must be presumed that it suited the purposes of Pudsey that such arrangements should be made with the Municipality; and it is equally obvious that Bradford needed a proper consideration for such obligations. The consideration, according to Mr. Balfour Browne, Q.C., is that on present parliamentary powers Pudsey must continue for an indefinite period to take water from Bradford, and cannot, by arrangement with Leeds, or even by the establishment of its own water-works, set aside an obligation upon which to some extent Bradford's very costly scheme of water-works extension was based. The effect of this position is that Pudsey can never fulfil the first requirement of a self-contained community, unless Parliament or the Law Courts should intervene. And so it is with other matters. Bradford has large vested interests in Pudsey which could not be furthered by separate incorporation; while at the same time it would be too costly a business to fight Leeds on the question of the inclusion of that district.

WATER SUPPLY QUESTIONS IN THE MIDLANDS.

Readers of the "JOURNAL" are aware that considerable attention is now being directed to the problem of water supplies in the counties of Leicester, Derby, and Nottingham. The water-works at Little Eaton, upon which the town of Derby is mainly dependent, were established in 1848; the sources of supply being the River Derwent and springs in the valley of Bottle Brook. Extensions have been made from time to time; and an important report has lately been presented to the Corporation by the Water Committee recommending the expenditure of considerable sums for the construction of filter tunnels, the enlargement of the Littleover reservoir, and the provision of engines and connections. Further, after careful consideration, the Committee have come to the conclusion that the promotion of a Bill for the supply of Derby from the Upper Derwent can be no longer deferred. Several other towns, however, have their municipal eyes upon this desirable source, and likewise intend promoting Bills of a similar character. This course of action is by no means looked upon with favour either by the Derby Corporation or by the Derbyshire County Council, both of whom not unnaturally regard the Upper Derwent as their own. These bodies might perhaps consent to an amicable arrangement with the Leicester and Nottingham Corporations; but the claim made by Sheffield for a share of the water is regarded as being geographically indefensible. The Upper Derwent water is most abundant, of excellent quality, and possesses only about 2° of hardness. If carried through Derby as far as Leicester, it will traverse some 66 miles; and there will therefore be a large number of local governing bodies whose good-will is a necessary condition for success.

At Leicester the necessity for further sources of supply is so strongly felt that it has been decided to apply to Parliament for sanction to obtain water from the Upper Derwent. The co-operation of the Derbyshire and Nottinghamshire Local Authorities is to be invited; and the total cost of the scheme, providing for 14 million gallons daily, is estimated at £3,000,000. Scarcity of water has been experienced at Leicester during the past five years, notwithstanding successive additions to the water-works. It was popularly supposed that the completion of the new Swithland reservoir, commenced in 1890, would postpone any trouble for some years; but events have proved this to be a mistaken notion. During the recent meeting of the Institution of Mechanical Engineers, a visit was paid to the works at Swithland, which cover a site of some 275 acres. The drainage area above the reservoir is 3500 acres, and, in addition, there is an overflow of 4400 acres from the drainage area of the Bradgate reservoir. In the reservoir there is capacity for storing 490 million gallons, and water drawn through the valve-tower is filtered through 3 feet of Leighton Buzzard sand. There are six filter-beds, having a total area of more than 88,000 square feet, with an aggregate filtering capacity of nearly 3 million gallons daily. Each filter-bed is provided with a sand-washer, similar to those used at the Grand Junction Water-Works. From a covered pure-water tank, the water is pumped to the Hall Gates service reservoir, at a distance of 2¼ miles, through a 20-inch rising main. The pumping-station contains two 143-horse power triple-expansion pumping-engines of marine type, built by Messrs. Easton and Anderson. There are three pumps, 12½ inches in diameter and 3 feet stroke, to each engine, each pumping 45 gallons per revolution. The diameters of the steam cylinders are 17, 27, and 44 inches. Electric lighting apparatus and electric water-level indicators are included in the appliances provided. The Engineer and Manager is Mr. F. Griffith; and the plans and estimates were approved by the late Mr. T. Hawksley, who was Consulting Engineer to the Water Department. Including the cost of land, the outlay involved at Swithland was £317,026; and the recently announced intention on the part of the Corporation of promoting a scheme, of which the share falling on Leicester will probably exceed £800,000, has not been very cordially received. A good deal of the criticism evoked is apparently due rather to the secrecy in which the proceedings have been enshrouded, than to the character of the project itself. On this score, the Council reply that it was necessary to avoid affording information for the benefit of other authorities who might become formidable rivals rather than partners. As no doubt whatever exists that the continued prosperity and advance of the town largely depends upon the quality and ample supply of water suited to local industries, it is hoped that the present scheme may be successfully inaugurated.

Padiham Gas Supply.—A proposition has been on foot to apply for a Provisional Order next session for the construction of new gas-works for the Padiham District Council. At the meeting of the Council on the 18th inst., however, it was reported that the Gas and Water Committee had decided, by a narrow majority, not to proceed with the matter.

The Price of American Pipes.—Referring to a paragraph appearing with this heading last week (p. 446), a correspondent writes that the action of the Glasgow Water Commissioners is an example of the fairness of British trading. "It may, to us, be somewhat of a disappointment to see our home producers underbid by those of other nations. It is, however, just possible that these low quotations are not likely to be permanent; but are only meant to serve for the opening up of a new market for United States manufactures, in reliance upon excellence of workmanship leading to a continuance of orders, even at rates as high as the home article. It is evident, too, that our manufacturers do not look upon their industry as at all played out; for another tube manufactory is just now being started in the Clyde district."

THE CLEVELAND (OHIO) TUNNEL EXPLOSIONS.

In the "JOURNAL" for the 26th ult., we announced, on the authority of a telegram received through Reuter's Agency, the occurrence of a fatal explosion in a tunnel in process of construction under Lake Erie for the Cleveland (Ohio) Water-Works. Some particulars as to the accident have since been furnished to the "Engineering Record" by Mr. M. W. Kingsley, the Chief Engineer. In all eleven men were killed; and though the explosion took place on the 11th of July, the last of the bodies was not recovered till the 18th. Unfortunately, an explosion occurred in the tunnel on the 11th of May, whereby seven men lost their lives.

The tunnel has a circular brick lining 13 inches thick and 9 feet in inside diameter, with its bottom from 105 to 109 feet below the surface of Lake Erie. The final length of the tunnel will be 26,000 feet; and at the time of the accident it had been excavated 6550 feet from the foot of the shore shaft, and finished up to about 16 feet from the working face. An air-lock was set in the tunnel at a point 3700 feet from the shaft and 2850 feet from the face; and beyond this lock the construction was going on under a pneumatic pressure of 22 lbs. per square inch above the atmosphere. The tunnel was absolutely dry; and the air pressure was maintained to prevent the clay from swelling in and to support the face and sides of the excavation until the lining was built. An odourless gas, supposed to be light carburetted hydrogen, penetrated the tunnel through seams in the clay. Its presence was detected from time to time by the hissing sound it made when escaping from the seams. Frequently, when there were any indications of it, holes were bored in the roof to exhaust the gas, which would blow against the tunnel pressure for a short time, and then stop. At the working face the lower half of the excavation was in plastic medium soft clay, without seams. Above this was plastic clay in 2-inch layers, with small seams of dry quicksand between. The excavating was done by hand with mattocks and shovels. No explosives were used. The regular ventilation of the tunnel while the work was in progress was maintained by a duplex air compressor with 14 in. by 16 in. cylinders, which constantly forced fresh air into the tunnel just beyond the lock. Every time the air-lock was operated, about 400 cubic feet of foul air, gas, &c., were drawn from the face to supply its pressure, and were, of course, replaced by the same amount of fresh air. After the explosion in May, additional ventilation and removal of gas was secured by constantly exhausting or wasting the air.

The tunnel was lighted only by incandescent electric lamps, and smoking and the use of matches were strictly forbidden. At the time of the explosion, the invert had been extended 16 feet from the finished lining to the face, and the arch centring was being put up. The inspector had just come out, and the bricklayers had probably begun laying the arch. There were 13 men between the air-lock and face of the work. The lock tender and one mule driver were at the air-lock, 2850 feet from the heading. One man was 350 feet from the heading when found, and one mule driver and a mule were found 150 feet from the face of the heading. The others were all near the face. The foreman in charge of the work was a very reliable man. He was found under the cave-in at the end of the work. There were 11 men killed, probably by burning and suffocation, and the foreman was crushed by the cave-in. The cause of the explosion is not known. There was no indication of a short circuit of the electric wires, and all the lights were afterwards found in good order up to 5600 feet from the shaft. Beyond this the wires had been knocked down by the explosion and the lamps broken. The explosion was followed by a slight fire, which burned only a few feet of flooring; and a bulkhead and flooring near the face were blown up. The tunnel itself was uninjured, though the clay caved in at the face. Shortly after the explosion, the tunnel was entered, and the men could go as far as 5300 feet, which was 1600 feet beyond the air-lock. The following morning, they could only go to 4300 feet. Late in the afternoon, another party succeeded in getting as far as 4900 feet. The next day, another party succeeded in getting up to 6150 feet. On July 14, parties were able to reach 6400 feet; but this was 500 feet beyond where the ventilating-pipe had been broken off by the explosion. On the 15th, the face of the work was reached. The tunnel itself was in perfect condition, without any sign of injury. The temporary bulkhead which had been constructed at 6200 feet was completely demolished; having been moved a distance of 120 feet, carrying plank, flooring, tracks, &c., with it.

After the explosion, air was forced into the tunnel through a 4-inch pipe, laid from the compressor to just beyond the air-lock, and was exhausted from the heading through a 2½-inch pipe. The valve at the air-lock was kept fully open, and the compressors were speeded up to maintain the air pressure in the tunnel. The quantity of air thus forced in per hour was sufficient to displace the foul air in 90 lineal feet of tunnel with pure air. One man was removed the 14th of July; nine men and a dead mule on the 15th; and the foreman, who was buried under about 40 tons of clay, on the 18th. On the morning of the 14th, a telephone was placed at 5600 feet. The current was then shut off the electric wires, and the wires cut to prevent any possibility of accident from the wires which were known to be down beyond this. The cars run up to this point, and the bodies were brought to them on stretchers from the face of the work. Beyond this point the tunnel was lighted with electric battery lamps.

The work is wholly at the Contractor's risk, with restrictions regarding the progress and quality of the work and ventilation. The contract requires him to have a compressed air plant on hand ready for use at any moment, otherwise there were no restrictions, except that he must not excavate more than he can line with masonry the same day. Both the Contractor and his Superintendent are experienced men in contract work. The Superintendent was Inspector for the City of Cleveland when the 7-feet tunnel was built in 1887 to 1890; and compressed air was used to support the excavation until it could be bricked up. Practically the same conditions regarding ground and gas existed there as in the present tunnel. The process here used was adopted on the 7-feet tunnel after several explosions had occurred and disasters had been met in attempting to go round bad ground.

It appears from a statement previously furnished to our contemporary by Mr. Kingsley that the accident which occurred on the 11th of May was caused by gas which had come in, unknown to the workmen, through the new excavation. The tunnel had been completed to a point 6281 feet from the shore shaft, and they had excavated, nearly ready for bricking, about 17 feet. The accident occurred about 12.45 p.m., while the men were taking their lunch. As nearly as can be learned, one of the workmen had unscrewed an old lamp from its socket, and was replacing it with a new one when the explosion took place. There were eight men at the face, seven of whom were killed; but no damage was done to the tunnel, with the exception that a few bricks in two places—one at 80 feet, and the other at 180 feet from the end of the brickwork—were forced upward about 1½ inches. In the face of the excavation the earth caved in to a height of 18 or 20 feet above the height of the tunnel. There were 53 feet of clay between the roof of the tunnel and the bottom of the lake; and the 20 feet caved in left about 33 feet of solid clay over the whole. The whole tunnel was lighted with incandescent lamps, and every precaution was taken in the wiring of the tunnel to make it safe.

KINGSTON (N.Y.) WATER-WORKS.

The old part of the city of Kingston (N.Y.) stands on a plain 180 feet above the level of high tide; but Rondout, which is now a part of Kingston, lies chiefly along the Rondout Creek, only a little above the tide-level, and on the slopes of a steep bluff rising to the Kingston plain at some places 100 feet above it. The population of the whole city in 1882 was about 20,000; and its annual increase has since been very small. In that year, Mr. W. R. Hutton was requested to examine different sources of water supply for the city, and devise a project for introducing it. He recommended taking the supply from the Sawkill, a mountain stream, and constructing a small reservoir, a pipe-line 7 miles long, and a distributing system. It was, however, against his advice that a contract was entered into with a Company who in 1883 built the works substantially as designed, including a 50-million gallon reservoir 350 feet above tide-level and 7 miles from the city limits, at a cost of about £68,000. The works, which were afterwards purchased by the Municipality, were in 1896 found inadequate; and Mr. Hutton was again retained for their improvement and extension. The cost of the new construction here described is about £43,400, exclusive of lands, engineering, &c. The estimated total cost of the new construction, extensions, repairs, &c., is about £66,600; and the amount paid for the old works is £93,600. We gather the foregoing facts from the "Engineering Record," in which the particulars here given were published.

A new 40-million gallon reservoir (No. 2) has been constructed on the Sawkill, at a level 100 feet higher than No. 1 reservoir, for the supply of the high points in Kingston. The 18-inch pipe from the old reservoir will be used to supply Rondout; while Kingston proper will receive its water through a 20-inch pipe from the new reservoir. The latter is formed by a dam 130 feet long, chiefly of masonry, across a narrow point in the bed of the stream, and raises the water 30 feet. The overflowed surface of the valley was cleaned of soil and vegetable matter, and was excavated to a depth of 5 to 6 feet. As the Sawkill is a mountain torrent, subject to floods of more than 8000 cubic feet per second on a watershed of 35 square miles, and of 6000 cubic feet per second on 25 miles, the wing walls and embankment of this dam have been raised 10 feet above the level of the overfall.

As the natural flow of the stream sometimes falls to a million gallons per day, a further storage is designed at Cooper's Lake, on one of the heads of the Sawkill, into which a neighbouring stream from Mink Hollow can easily be diverted. The old reservoir (No. 1) is formed by an earthen embankment across the valley; the overflow escaping through a rock-cut 225 feet wide and 350 feet above tide-level. From this the original 18-inch pipe, 7 miles long, to the city limits of Kingston is now extended by a line of 16-inch pipe provided for the exclusive supply of Rondout and the low-level area.

A cast-iron supply-pipe 20 inches in diameter and 47,000 feet long supplies Kingston proper, or the upper level, the greater part of which is about 180 feet above tide water, though some portions are 100 feet higher still. The pipes from the two reservoirs are connected below the old reservoir; valves for regulating the pressure being placed in the connection. The original pipe-line was taken across Esopus Creek, 180 feet wide, on a structure of piles. The new line is carried in a dredged channel under the bed of the stream in a pipe with flexible joints.

The water of the Sawkill is normally pure, but during the spring and summer floods it becomes heavily charged with sediment; and in the hot dry season, being confined in reservoirs, it acquires a disagreeable taste and odour. To prevent this, there has been installed half a mile below the reservoir a plant consisting of eight pressure filters, capable of filtering 4 million gallons per 24 hours. The supply-pipes from both reservoirs are connected with these filters. An 18-inch and a 20-inch Venturi meter have also been purchased, one for each main pipe-line. The construction of the new work included about 3800 tons of new pipes, 45,000 cubic yards of earth excavation, 10,700 cubic yards of rock excavation, 12 air-valves, about 20 gate-valves, and the construction of masonry chambers for air-valves, gate-valves, blow-offs, &c.

The pipe is laid with its top at least 3 feet below the surface of the ground in earth, and 4 inches deeper in rock. The trench was 3 feet wide at the bottom in earth, and 4 feet in rock. The bottom of the trench was refilled with fine earth rammed 4 inches deep, and upon it each 12-foot length of pipe was supported on two sets of 12-inch wedges 3 inches thick, carried on 2 in. by 6 in. blocks 30 inches long. After the joints had been poured and caulked, the trench was back-filled by ramming earth round the pipe with pointed iron bars. No stone was permitted within 2 feet of the pipe. All pipes were tested to 300 lbs. hydraulic pressure, heated, and dipped in a hot bath of coal-tar pitch and linseed oil.

The dam consists of a weir made of concrete and faced with broken-range ashlar. The back is plastered with portland cement mortar. The gravelling above the weir is paved in cement mortar for a short distance back from the dam. The remainder is protected with riprap. A concrete apron below the dam is intended to be protected on the top with iron rails. The wing walls rise 10 feet above the crest of the weir, and conform to the slopes of the embankment. They are of rubble masonry; all exposed surfaces being faced with broken-range ashlar, and the walls coped with steps. The backs of the walls are battered and plastered with cement mortar. The core-wall is of concrete, built with a batter and

plastered. The embankment material on both sides of the core-wall, against the wings, and wherever it is in contact with masonry, is puddled. Elsewhere it is rammed or rolled with a grooved roller. The inner slope is protected by paving laid upon 6 inches of broken stone. The foot of the outer slope is protected by a heavy riprap.

The gate-house is built, in connection with one of the wing walls, of rubble masonry, laid to a fair face within and without, and faced on the exterior with broken-range ashlar from the coping to 5 feet below the flowage line. Supply and waste pipes pass under the embankment to a gate chamber in the foot of the outer slope.

The selected embankment material was spread in layers 6 to 8 inches in thickness, and the puddled portions were thoroughly wet, and well cut and worked with the shovel into a compact and cohesive mass. All masonry was laid in cement mortar that entirely filled all joints. Mortar was generally made of 1 part of cement to 2 parts of sand, with a moderate quantity of water. The cement and sand were mixed dry, on a platform of boards, the water added, and the whole thoroughly worked. The paving is of hard, sound stone, roughly shaped with the hammer to moderately close joints, and laid upon 6 inches of broken stone or gravel, not exceeding 2 inches in its greatest dimension. The concrete was composed of 1 part of cement, 2 parts of sand, and 5 parts of broken stone or clean gravel of various sizes, less than 2 inches in diameter. It was deposited in layers not exceeding 8 inches, and rammed until the mortar appeared on the surface. When placed against the other masonry, as against a facing of dressed stone, the backs of the stones to be connected were plastered with mortar at the time of placing the concrete.

The weir on the down-stream side, the exposed faces of the wing walls, and the gate-house from 5 feet below the water-line, are faced with broken-range ashlar of squared stone dressed to parallel beds and vertical ½-inch joints, jointed square 6 inches back from the face, and well bonded. Besides frequent headers, the courses vary in width to bond well with the backing. The face stones of the weir are laid in portland cement, and carefully connected with the concrete backing. No stone was allowed less than 8 inches high, except an occasional leveller, which was not less than 4 inches. No stone has less bed than height, or less than 15 inches. All angles have chisel drafts 1½ inches wide. The wing walls are finished with stone steps 2½ feet wide, not less than 8 inches thick; each step extending a foot under the step above it. The stones were rectangular blocks, no face varying more than 2 inches from a plane, through its lowest part. Coping for the weir is of dressed stone not less than 8 inches thick, or than 2½ feet wide; each stone extending from front to rear of the weir, closely jointed, and secured with bolts or dowels. The gate-chambers are coped with dressed blue stone over the entire wall, rebated for the flooring. There are in each of the gate-chambers grooves for stop-planks generally extending from 6 in. by 6 in., top to bottom. They are cut clean and smooth in solid stone for the outer grooves, and for the upper 6 feet of the inner grooves. Below 6 feet the inner grooves are made in alternately one and two stones. The waste and supply pipes are bedded in cement, and are controlled by sluice-gates at the upper end, and also by the ordinary water-gates in a chamber at the foot of the outer slope.

The filters are so arranged that any one may be cut off or used separately, and any one may be connected to either the high or the low pressure supply or delivery, or washed with water from either main, at will. The mains themselves are so valved that both systems may be supplied from either pressure, and with filtered or unfiltered water. The system is so cross-connected that almost any desired distribution of water can be readily effected. Normally, the filters in one side of the filter-house are supplied by the high-pressure system, and deliver to the high-pressure district; while those on the other side are devoted to the low-pressure supply and delivery. The water is in both cases introduced at the top of the filter, and delivered from the bottom. When the filters are washed, unfiltered water is used, which is delivered through into the same connection from which the effluent water is normally discharged. Passing upward through the filter in the reverse direction, the water breaks up the bed and washes it, and is discharged through the top and into the funnel top of a waste-pipe connecting with the sewer.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The accounts of the Aberdeen Corporation Gas Department for the year ending July 31 last have been published. They show a total revenue of £83,203, of which £70,276 was derived from the sale of gas; and an ordinary expenditure of £64,733. There is thus a balance of £18,470. Out of this sum there are payable annuities (£4903) and interest, sinking fund, and other charges, which raise the payments to £16,259; leaving £2211 to be carried forward. A balance of £3654 was brought forward from the previous year; and there is thus now in hand a surplus of £5865. Twelve months ago the price of gas was reduced from 3s. 4d. to 3s. 2d. per 1000 cubic feet; and the accounts of the year just closed, as compared with those of the preceding year, show the following comparisons: Gas-rental, a decrease of £1146; and total revenue, an increase of £2203. Last year discounts amounted to £2492, and bad debts to £466. The output of gas was 493,875,000 cubic feet, an increase of 19,061,000 cubic feet. In 1872, the output of gas was 146¼ million cubic feet; in 1875, 188 millions; in 1885, 302 millions; in 1895, 430 millions; in 1896, 460 millions; and in 1897, 474 millions. Unaccounted-for gas has fallen from 15·64 per cent. in 1872 to 7·96 per cent. last year. This is a record of progress that is eminently gratifying. Much of it is due to the excellent management of Mr. Smith, the Gas Engineer; but, of course, the great expansion of the city is the chief cause of the enormous increase in the consumption of gas. I have not statistics by me, but I imagine that Aberdeen is about the most progressive city in Scotland at the present time; and while this state of things exists, there is good augury for the continued prosperity of the gas undertaking.

There are few records in the annals of the gas industry in Scotland which will compare with that of Mr. James Thomson, the Manager of the Inverness Gas-Works. His report to the Commissioners for the year ending May 15 last states that a new chimney is being erected at the works. The quantity of coal carbonized during the past year was 7043 tons; and the

GAS AND WATER COMPANIES STOCK AND SHARE LIST.

Referred to on p. 476.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Apl. 15	10½	Alliance & Dublin 10 p. c.	22¼—23¼	−1	4 9 4
100,000	10	,,	7½	Do. 7 p. c.	16½—17½	+½	4 5 9
300,000	100	July 1	5	Australian 5 p. c. Db.	105—107	..	4 13 6
200,000	5	May 26	6	Bombay, Ltd.	6¼—6¾	..	4 8 11
40,000	5	,,	6	Do. New, £4 paid	4½—5	..	4 16 0
380,000	Stk.	Aug. 12	12	Brentford Consolidated	275—280*	..	4 5 9
240,000	,,	,,	9	Do. New	210—215*	..	4 3 9
50,000	,,	,,	5	Do. 5 p. c. Prf.	140—145*	..	3 9 0
159,375	,,	June 10	4	Do. 4 p. c. Db. Stk.	130—135	..	2 19 3
220,000	Stk.	Mar. 30	11½	Brighton & Hove Orig.	268—273	..	4 4 3
226,320	,,	,,	8½	Do. A. Ord. Stk.	195—200	..	4 5 0
933,500	Stk.	Feb. 24	5	Bristol, 5 p. c. max.	127—132	..	3 15 9
420,000	20	Ma . 30	11½	British	53—54	−½	4 3 4
50,000	10	Aug. 12	11½	Bromley, Ord. 10 p. c.	25—27*	..	4 5 2
75,000	10	,,	8½	Do. 7 p. c.	20—22*	..	3 17 3
500,000	10	Apl. 29	6	Buenos Ayres (New) Ltd	9—9½	..	6 6 4
98,122	Stk.	June 29	4	Do. 4 p. c. Db. Stk.	98—100	..	4 0 0
150,000	20	July 14	8½	Cagliari, Ltd.	29—30	..	5 10 0
100,000	10	June 10	7	Cape Town & Dis., Ltd.	15—16	..	4 7 6
50,000	50	May 3	6	Do. 6 p. c. 1st Mort.	58—60	..	5 0 0
550,000	Stk.	Apl 15	13½	Commercial Old Stock	315—325	..	4 3 1
200,750	,,	,,	10½	Do. New do.	252—257	..	4 1 8
200,750	,,	June 10	4½	Do. 4½ p. c. Db. do.	148—153	..	2 18 10
800,000	Stk.	June 10	12	Continental Union, Ltd.	207—212	..	5 13 2
200,000	,,	,,	9	Do. 7 p. c. Prf.	197—202	..	4 9 1
51,600	Stk	Feb. 24	14	Croydon A 10 p. c.	310—315	..	4 8 11
168,400	,,	,,	11	Do. B 7 p. c.	255—265	..	4 3 0
555,000	Stk.	Aug. 12	5½	Crystal Palace Ord. 5 p. c.	125—130*	..	4 0 9
60,000	,,	,,	5	Do. 5 p. c. Prf.	140—145*	..	3 9 0
486,090	10	July 28	11	European, Ltd.	23—24	..	4 11 8
354,060	10	,,	11	Do. £7 10s. paid	16½—17½	..	4 14 4
5,922,230	Stk.	Aug. 12	12½	Gaslight & Coke, A, Ord	292—297*	+1	4 2 6
100,000	,,	,,	4	Do. B, 4 p. c. max.	120—125*	..	3 4 0
665,000	,,	,,	10	Do. C, D, E, 10 p. c. Prf.	305—310*	..	3 4 6
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	152—157*	..	3 3 8
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	230—240*	..	3 2 6
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	193—198*	..	3 10 8
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	305—310*	..	3 4 6
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	182—187*	..	3 4 2
1,061,150	,,	June 10	4	Do. 4 p. c. Db. Stk.	131—133	..	3 0 2
294,850	,,	,,	4½	Do. 4½ p. c. do.	148—153	..	2 18 10
958,000	,,	,,	6	Do. 6 p. c. do.	198—203	..	2 19 1
70,000	10	May 12	8	Hongkong & China, Ltd.	13½—14½	..	5 10 4
3,800,000	Stk.	,,	10	Imperial Continental	210—215	..	4 13 0
376,400	100	Aug. 2	4	Do. 4 p. c. Dbs. Red.	98—101	..	3 19 3
473,600	Stk.	Aug. 12	3½	Do. 3½ p. c. Db. Stk.	101—104*	..	3 7 4
560,000	100	Apl. 1	5	Met. of Mel- bourne 5 p. c. Db.	111—113	..	4 8 10
250,000	100	,,	4½	4½ p. c. Db.	107—109	..	4 2 7
				* Ex div.			

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
75,000	5	June 29	6	Malta & Medn., Ltd.	4¾—5¼	..	5 14 3
541,920	20	June 10	5	Monte Video, Ltd.	14—15	..	6 13 4
617,946	Stk.	Feb. 24	9¾	Newc'tle & Gatesh'd Con.	235—240	..	4 1 3
252,355	Stk.	Jan. 3	3½	Do. 5½ p. c. Db. Stk.	113—117	..	2 19 10
150,000	5	May 26	8	Oriental, Ltd.	7—7½	..	5 6 8
135,000	5	,,	8	Do. New, £4 10s. pd.	6—6¼	..	5 10 9
15,000	5	,,	8	Do. do. 1879, £1 pd.	1—1¼	..	5 6 8
60,000	5	Mar. 11	7	Ottoman, Ltd.	5—5½	..	6 6 2
500,000	100	June 1	6	People's Gas 2nd M. of Chicago Bd.	103—108	..	5 11 1
848,070	10	May 26	6	River Plate Ord.	9—9½	..	6 6 4
250,000	Stk.	June 29	4	Do. 4 p. c. Db. Stk.	98—100	+1	4 0 0
250,000	10	Apl. 29	10	San Paulo, Ltd.	15—16	..	6 5 0
135,000	Stk.	Mar. 30	10	Sheffield A.	247—250	+2	4 0 0
209,053	,,	,,	10	Do. B.	247—250	+2	4 0 0
447,427	,,	,,	10	Do. C.	247—250	+2	4 0 0
5,600,000	Stk.	Aug. 12	5⅓	South Metrop., 4 p. c. Ord.	140—143*	..	3 14 7
1,460,000	,,	July 14	3	Do. 3 p. c. Db. Stk.	101—104	..	2 17 8
60,000	Stk.	Mar. 11	12	Tottenham and A. Edmonton B.	285—295	..	4 1 4
60,000	,,	,,	9		205—215	..	4 3 9
182,380	10	June 10	7	Tuscan, Ltd.	11½—12½	..	5 12 0
149,900	10	July 1	5	Do. 5 p. c. Dbs. Red.	100—103	..	4 17 1
				WATER COMPANIES.			
746,164	Stk.	June 29	10½	Chelsea, Ord.	313—318	..	3 6 0
150,000	,,	,,	5	Do. 5 p. c. Prf.	170—175	..	2 17 2
160,000	,,	,,	4½	Do. 4½ p. c. Pf. Stk., 1875	148—152	..	2 19 3
175,785	,,	Mar. 30	4½	Do. 4½ p. c. Db. Stk.	157—162	..	2 15 7
1,720,560	Stk.	Apl. 15	8	East London, Ord.	222—227	−3	3 10 6
654,740	,,	June 29	4½	Do. 4½ p. c. Db. Stk.	157—160	..	2 16 3
390,000	,,	,,	3	Do. 3 p. c. Db. Stk.	103—105	..	2 17 2
700,000	50	June 29	7½	G'd Junct'n, 10 p. c. max.	115—118	..	3 3 7
310,000	Stk.	Mar. 30	4	Do. 4 p. c. Db. Stk.	142—147	..	2 14 5
708,000	Stk.	Aug. 12	14	Kent	364—369*	..	3 15 11
160,000	,,	,,	7	Do. New, 7 p. c. max.	212—217*	..	3 4 6
1,043,800	100	June 29	10	Lambeth, 10 p. c. max.	298—303	..	3 6 0
406,200	100	,,	7½	Do. 7½ p. c. max.	227—232	..	3 4 8
350,000	Stk.	Mar. 30	4	Do. 4 p. c. Db. Stk.	140—145	..	2 15 2
500,000	100	Aug. 12	12½	New River, New Shares	425—430*	..	3 1 8
1,000,000	Stk.	July 28	4	Do. 4 p. c. Db. Stk.	140—145	..	2 15 2
902,300	Stk.	June 29	6	Southw'k & V'xhall, Ord.	166—171	..	3 10 2
126,500	100	,,	6	Do. do. 7½ p. c. max.	157—162	..	3 14 1
489,200	Stk.	,,	5	Do. do. 5 p. c. Prf.	168—172	..	2 18 2
1,019,585	,,	Apl. 15	4	Do. 4 p. c. A Db. Stk.	141—144	..	2 15 7
1,155,066	Stk.	June 10	10	West Middlesex	300—305	..	3 5 7
200,000	,,	,,	4½	Do. 4½ p. c. Db. Stk.	162—165	..	2 14 7
200,000	,,	Mar. 11	3	Do. 3 p. c. Db. Stk.	104—106	..	2 16 7
				* Ex div.			

gas made was 67,120,000 cubic feet. The gas sold was 61,791,000 cubic feet—an increase of 3,894,000 cubic feet, or 6·84 per cent. over the quantity in the preceding year. The gas unaccounted for amounted to 5,329,000 cubic feet, or 8 per cent. of the make, which was 2 per cent. less than in the preceding year. During the year, 178 new consumers were added, of whom 44 were furnished with prepayment meters, the consumption through which was close upon 800,000 cubic feet. There was a surplus of £1886 on the year's working. It has been resolved to reduce the price of gas, as from the November survey, from 3s. 9d. to 3s. 4d. per 1000 cubic feet. To do this, a sum of £1350 will be required, so that there will still be a margin to the good. Mr. Thomson has been in Inverness for about 14 years. In his time he has reduced the price of gas by more than one-half, and has, in addition, abolished meter-rents. The boon he has conferred upon the community of Inverness is thus extensive; and it is also far-reaching. It has been accomplished by a thorough renovation of the works, which is the first and most essential condition of prosperous working. Along with this, the introduction of modern processes has not been neglected, even to the working up of residual products, the plant for which is considered to be quite of a model description. Mr. Thomson possesses the confidence of his Commissioners—a circumstance which is productive of as much favour to them as to him, for, without trust, a manager may do his best, but the result sought will not be obtained.

The "Hamilton Advertiser" publishes the following with reference to a find at the Linlithgow Gas Company's works: "As mentioned by us in a recent issue, specimens of the relics turned up in the course of the excavations at the gas-works have, at the instigation of Mr. W. H. Henderson, been seen by experts, who have expressed the opinion that some of the relics, such as the pieces of old earthenware, belong to the thirteenth century. As this would be about the time when the palace was being re-edified, it is possible that the articles in question may have been pitched into what would then be the west bay of the loch. One of the bones found is the jawbone of a wolf. Others are supposed to be those of the original Scottish ox, the wild boar, stag, roebuck, &c. Some of the 'finds' are no doubt interesting, and perhaps none more so than specimens of the old-fashioned earthenware, which, as we have said, are believed to belong to the time of King Robert the Bruce."

It was mentioned in the "JOURNAL" last week that a new "irregularity" had been unearthed in connection with the Perth Corporation Gas-Works. The "Dundee Courier," which does not seem to hold a mandate for the policy of keeping the pot of dissent boiling, lays bare in all its nakedness this latest "corrupt practice." It consists of nothing less than this—that whereas for some years the Gas Commissioners have been in the habit of voting £15 annually towards the expenses of the employees' excursion, the actual disbursements have been found latterly to mount up to £40; and the accounts have been in the habit of being passed by a Convener initialling them, without their being brought before a Committee at all. The Convener this year refused to pass them, very properly, I think, because, if £15 was the amount voted, it should not have been exceeded without the due formalities being observed. It is proposed this year to restrict the payment from the funds of the Gas Commission to the £15, and to make up the balance by subscriptions from the workmen "and others." I am afraid the "others" will have to bear the burden; and rightly, too, because the workmen would not be the parties who led to the increased outlay. I am afraid that this increased outlay has been necessitated by too many other than workmen attending the outing, and being treated to better fare than the workpeople. If so, there need be no sympathy with any who may be called upon to subscribe for their day's amusement. If the Commissioners were minded to take a day by themselves, and to have some friends with them, there would be no harm; and an outlay of £40 upon the occasion would not be amiss. But if they go out with the workmen, they should be as the workmen. It is quite right that the practice which has been discovered should be put a stop to, and that the pleasures of the staff should be paid for in a manner which will permit of no cavil; but it is scarcely a subject which is worthy of being magnified into an "irregularity." At the same time, the voting of £15 for the day's outing is a species of giving and yet withholding, because it is not sufficient for the purpose. The Commissioners should either defray the whole, whatever it is, or have nothing to do with it.

The water supply to Edinburgh and Leith has, during the summer which is just closing, given the officials of the Water Trust some anxiety. There was at no time fear of a famine this season; but the pressure fell so low that some parts of the district were with difficulty supplied, and warnings were issued against waste. There was also the possibility of another dry winter, with the result of a deficient supply next summer.

During the past year, the revenue of the Aberdeen Corporation Water Department amounted to £25,741, or, with a balance of £1872 brought forward from the preceding year, to £27,613. The expenditure included: Maintenance of works, £6564; interest, £6712; management, £687; and balance of cost of Deacon meters and repairs at the Mannofield and Invercann reservoirs, £1575. A sum of £1000 has been set aside towards the renewal of the main aqueduct, making this fund £2000; and £9041 has been placed to sinking fund. The balance is £2034.

At a recent meeting of the Greenock Water Trust, it was reported that the income for the past year was £19,289, and the expenditure £19,087; leaving a surplus of £202. The estimates for the current year show an income of £19,319, and an expenditure of £19,300; giving an estimated surplus of £19. Provost Erskine moved the adoption of the minutes, which, besides containing the statement of finances, bore a recommendation from the Committee that the existing rates of assessment—namely, 6d. in the pound for the domestic water-rate, and 1d. in the pound for the public water-rate—be continued for the current year. The Provost commented with satisfaction on the state of the Trust's finances, and pointed out that they had at present 120 days' water supply, as compared with 163 days' supply at the corresponding period of last year. The minutes were adopted.

Increase in the Price of Gas at Falmouth.—Owing to the high price of coal as the result of the strike in South Wales, the Falmouth Gas Company announce an increase in the price of gas, after the 30th prox., of 4d. per 1000 cubic feet; making the price 3s. 4d., less the usual discounts.

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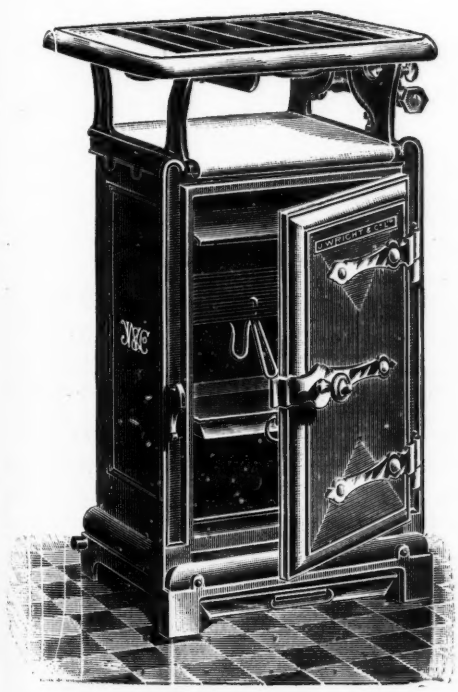

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CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Aug.* 27.

Sulphate of Ammonia.—The demand has been well sustained throughout the week; and all ready parcels have been picked up at hardening prices. There has also been some anxiety to secure September delivery; and a considerable portion of the September make has been sold at about the level of spot prices. The closing quotations are £10 2s. 6d. per ton f.o.b. Hull; and £10 5s. per ton f.o.b. Leith and Liverpool. Consumers have come forward more freely; and there has been a larger proportion of direct business than has been the case recently. There has been less interest in the further ahead position; but early in the week £9 17s. 6d. per ton was paid for October-March, f.o.b. Leith. The quotation at the close is £10 per ton f.o.b. Leith, ordinary terms; London, Beckton terms, £9 15s., October-December delivery.

Nitrate of Soda is firm in all positions; and the difficulty of securing tonnage is beginning to point to a shortage of supplies for the early spring months. The spot quotations are 7s. 7½d. per cwt. for ordinary, and 7s. 9d. per cwt. for refined quality.

LONDON, *Aug.* 27.

Tar Products.—The week has shown no change of moment in the value or volume of business done. Benzols are changing hands at the extremely low prices now quoted; and although buyers are asking for forward contracts at these rates, none but urgent sellers are disposed to sell ahead at them. Naphthalene is more inquired after, and is said to be scarce, owing to the improved demand for creosote at prices better for the distiller with the naphthalene left in it. Carbolic acid is steady; and there are buyers in all positions at prices quoted below. Anthracene keeps low, with no fresh move on the part of buyers, who are evidently waiting to see how far pressing sellers will reduce that article. At such prices as are now prevailing for anthracene, manufacturers would be foolish to separate it from their oils; much more to recover it by distillation. At the low rates now obtaining, the anthracene market should rectify itself by lessened production, though this may take some time.

The average quotations of the week are: Tar, 12s. 6d. to 16s. 6d. Pitch, east coast, 24s.; west coast, 20s. Benzols, 90's, 9½d.; 50's, 9⅜d. Toluol, 1s. 1d. Solvent naphtha, 1s. 2d. Heavy naphtha, 1s. 1d. Crude, 30 per cent., naphtha, 4¼d. Creosote, 2¼d. Heavy oils, 42s. 6d. Carbolic acid, 60's, 1s. 11½d. Naphthalene, pressed, 60s.; salts, 32s. 6d. Anthracene, "A," 4d.; "B," 3d.

Sulphate of Ammonia has enjoyed a strong market during the week. There is some hesitation on the part of buyers to go on at the higher prices now quoted; but as there are no stocks of the article in this country, it looks as if they must pay the price makers ask. Prompt values are £10 2s. 6d. to £10 5s., less 3½ per cent., according to port of shipment.

The Wallingford Corporation and the Gas-Works.—The Wallingford Gas Company have refused the offer of the Corporation to purchase their undertaking for £7500; this sum being the estimate of the valuer employed by the Town Council.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The month closes, as anticipated, with a very general upward move in prices. The leading Manchester colliery firms—acting in conjunction with representatives of important collieries in the immediately surrounding district—have decided to advance all descriptions of round coal, except the very best house-fire qualities, 10d. per ton; steam and furnace coal, 10d.; nuts, 10d.; and burgie and slack, 5d. These advances apply to the pit and wharf prices, and also to the delivered rates to private consumers. In other Lancashire districts, the advance ranges from 6d. up to 1s. per ton on round coal; but the maximum advance is only being carried out in exceptional cases. With regard to burgie and slack, it is doubtful to what extent the advance will be put in force, as on this class of fuel prices have been hardening up for the last two or three months. At present, it is scarcely possible to give actually precise quotations, as the advance in prices is not sufficiently definite in all cases. But it is probable they will settle down to something like an average of 10s. 6d. to 11s. per ton at the pit for best Wigan Arley; 9s. to 9s. 6d., for Pemberton four-feet and seconds Arley; 7s. 6d. up to 8s., for common round coals; with slack ranging from about 3s. 9d. to 4s. 6d. for the lower and medium qualities, up to 4s. 9d. and 5s. 3d. for the best descriptions. As regards trade generally, the better qualities of round coal have been moving away in average quantities for the time of year, with steam and forge coals in active demand for inland requirements, and burgie and slack also generally meeting with a ready sale, though supplies are not at all scarce in the market. In the shipping trade, there has been a continued brisk inquiry which has been sufficient to take away any surplus supplies of round coal which colliery proprietors have had to offer, with the result that pits have been kept on practically full time, and little or nothing has been going into stock during the last few weeks. Delivered at ports on the Mersey, ordinary steam coal has been fetching 9s. 6d. to 10s. per ton; and special qualities, 10s. 3d. to 10s. 6d. Delivered at the Partington tips of the Manchester Ship Canal—where a large trade has been done recently—the price is about 11s. per ton.

Northern Coal Trade.—The pressure for coal continues undiminished in the North-Eastern coalfields; but there are signs that the demand will soon be reduced by the return of the Welsh miners to work. There is still a strong demand for best Northumbrian steam coals. Prices are firm at about 14s. 6d. per ton f.o.b.; while second-class steam are 12s. 6d., and steam smalls 7s. 6d. The gas coal trade is very brisk; and the general tendency is towards firmness in price. Two local gas companies are now in the market for tenders; and it may be taken for granted that there will be a considerable advance in the quotations when compared with those that have ruled under the expiring contracts. Prices vary a little more for occasional cargoes—up to 10s. per ton f.o.b. being asked; but there is only a limited amount for sale beyond the quantities under contract. Prices of gas coke are steady.

Scotch Coal Trade.—Great activity still characterizes the coal trade in Scotland, and will probably continue to do so for some time. Except in Fifeshire, the question of wages is likely to be amicably adjusted with the

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WINDSOR STREET WORKS, BIRMINGHAM	2,000,000	MONTREAL	500,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	BELLEVILLE	250,000
COLCHESTER	300,000	OTTAWA (Second Contract)	250,000
BIRKENHEAD	2,250,000	BRANTFORD (Remodelled)	200,000
SWINDON (New Swindon Gas Co.)	120,000	ST. CATHERINES (Remodelled)	250,000
SALTLEY WORKS, BIRMINGHAM (Second Contract)	2,000,000	KINGSTON, PA.	125,000
WINDSOR STREET WORKS, BIRMINGHAM (Second Contract)	2,000,000	PETERBOROUGH, ONT.	250,000
HALIFAX	1,000,000	WILKESBARRE, PA.	750,000
TORONTO	250,000	ST. CATHERINES (Second Contract)	250,000
OTTAWA	250,000	BUFFALO, N.Y.	2,000,000
LINDSAY (Remodelled)	125,000	WINNIPEG, MAN.	500,000
		COLCHESTER (Second Contract)	300,000
		YORK	750,000

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miners. The Lothians' masters conceded a 10 per cent. advance last week. In Fifeshire, a conference was held in Dunfermline last Friday, at which it was pleaded by the masters that, on account of their having been so much contracted forward, they had not participated in the rise in the price of coal to the same extent as had coalmasters in the West of Scotland; and they objected to wages in Fifeshire being fixed according to what was being paid in the West. The conference ended without result. The masters are, however, to meet to consider what is to be done. Meanwhile, the miners have been advised by their leaders, in view of the failure of the conference, to prepare their notices to cease work. The prices quoted are: Main, 10s. per ton f.o.b. Glasgow; ell, 11s. to 11s. 6d.; splint, 10s. 6d. to 11s. The shipments for the week amounted to 245,615 tons—an increase of 23,824 tons upon the preceding week, and of 59,532 tons upon the corresponding week of last year. For the year to date, the total shipments have amounted to 6,132,289 tons—an increase upon the same period of last year of 1,060,870 tons.

Additional Capital for the Portsmouth Water Company.—At an extraordinary general meeting of the Portsmouth Water Company held last Thursday, the Directors were authorized to raise so much of the £90,000 of additional capital sanctioned by the Order granted last session as they might deem necessary, at interest not exceeding 5 per cent. on the nominal value of the shares or stock.

The Quality of the Vyrnwy Water.—At the meeting of the Water Committee of the Liverpool Corporation last Tuesday, Alderman Radcliffe expressed himself strongly in reference to a speech recently made at the meeting of the Chester Water-Works Company by Mr. F. E. Roberts (*ante*, p. 386), to the effect that the Vyrnwy water was "particularly rich in typhoid germs." Dr. Hope, the Medical Officer of Health, had reported that the allegations were too frivolous for notice, and all reports made by Professor Boyce during the past twelve months proved that the Vyrnwy water was of most exceptional purity, and not a typhoid organism, or anything that could possibly be allied to it, had ever been found in it.

Harrow and Stanmore Gas Company.—At the half-yearly general meeting of this Company next Monday, the Directors will report continued progress in the business. The sale of gas produced £6103, residuals brought in £1110, and the total revenue was £7529 in the six months ending June 30. The expenditure on the manufacture of gas was £3823, coals costing £2710; and the total expenses amounted to £5017—leaving £2512 to go to the profit and loss account. The balance on this account is £2575; and the Directors will recommend a dividend at the rate of 7½ per cent. per annum on the "A" capital, of 7 per cent. per annum on the additional "B" capital, of 5¼ per cent. per annum on the additional "C" capital, and of 6 per cent. per annum on the guaranteed shares—all less income-tax. The quantity of gas made in the six months was 31,789,000 cubic feet, as compared with 28,438,000 cubic feet in the corresponding half of 1897; the quantities accounted for being 28,220,000 and 26,576,000 cubic feet respectively.

Gas and Sulphate Producer, Limited, is the title of a Company which has been registered with a capital of £30,000, in £1 shares, to enter into an agreement with the Patent Oxide Syndicate, Limited, and to carry on the general business of a gas company.

Reductions in Price.—The Gas Committee of the Warrington Corporation have decided to reduce the price of gas 3d. per 1000 cubic feet as from the 1st of November next. This will mean a reduction of about £3000 per annum. The Dover Gas Company have reduced the price of gas to 2s. 5d. per 1000 cubic feet as from the 1st of July.

The Charge for Water in Manchester.—The Water Committee of the Manchester Corporation contemplate a reduction in the charges for water. A surplus of £35,000 has accumulated; and subject to the approval of the City Council, 2d. is to be taken off the public water-rate in the city, and 1d. off the domestic water-rate in and beyond the city. These reductions will represent £23,400 and £6500 respectively. In addition, the Council will be recommended to make a reduction of 5 per cent. in the charge for meter-rents in cases in which the minimum is above a certain figure. In this way another £4642 of revenue will be disposed of.

The Dorking District Council and the Water-Works.—At the last meeting of the Dorking District Council, some reference was made to the complaints which have arisen as to the water supply of the town. A letter from the Secretary of the Water Company (Mr. T. A. S. Scott) was read, stating that every effort had been and was being made to afford the utmost possible supply to the consumers until the new Deepdene source was available. The Clerk subsequently advised the Council as to the best means of acquiring the undertaking of the Company; and, in the result, a resolution was carried to the effect that the Clerk should be instructed to write to the Secretary of the Company, asking if they were prepared to sell their works and plant, and requesting a reply within 28 days; and that, failing the receipt thereof, steps should be taken by the Clerk, as Solicitor to the Council, to publish all necessary notices for promoting a Bill in Parliament for acquiring the power to supply the district with water, or for taking over the present Company's works.

Settlement of the Water Dispute at Prescot.—As already briefly intimated, arrangements have been provisionally made by the Liverpool Water Committee with the Prescot Authorities for ending the litigation that has so long existed on the question of the water supply to the latter town. It has been arranged that all pending proceedings shall be abandoned, and that the rights of all parties in respect of the future water supply to Prescot be reserved. The penalties and costs awarded by the Prescot Petty Sessions against the Liverpool Corporation in the case of *Mercer v. Liverpool Corporation* are not to be enforced; and the pending appeal by the Corporation is to be abandoned. Further, the Corporation are to pay the plaintiff's Solicitors the costs incurred in connection with the Prescot water supply question, receiving credit for all sums paid by the Corporation for penalties and costs. In order to enable these terms to be submitted to the Corporation, the present appeal in Welsby's case is to stand over by consent; while the pending summonses are also adjourned. The Water Committee carefully considered these terms at their last meeting, and decided to accept them.

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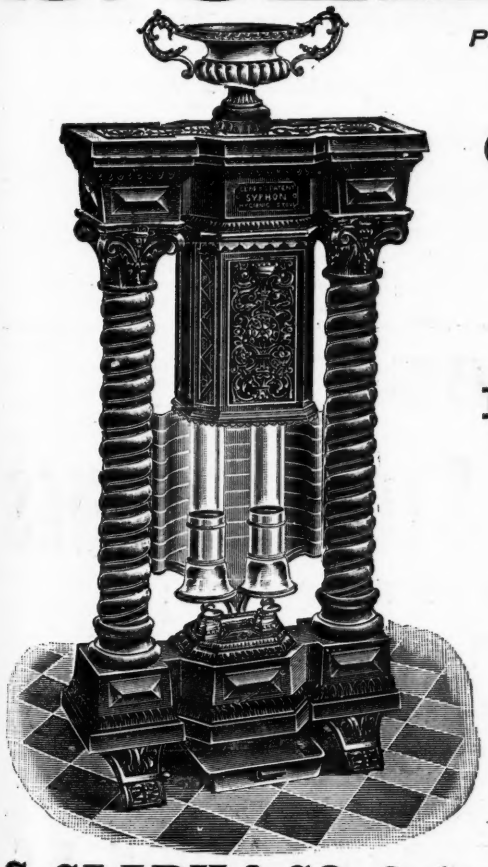

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The Water Supply of Hampton Court Palace.—The Local Authority at Hampton Court are engaged in digging up the identical leaden pipes which Cardinal Wolsey laid down for the purpose of supplying his great palace with pure water. The system adopted, says the London Correspondent of the "Yorkshire Post," reflects much credit upon the skill of the engineers and workmen of the time. The springs at Coombe Hill, some three miles from Hampton Court, were collected into conduits. The pipes had to be carried across the bed of the Thames, and the exact spot is found to be nearly half a mile above Kingston Bridge. They then passed up the Home Park to the palace. The pipes weighed 15 lbs. per foot, and the total cost must have reached £50,000.

Sutton Valence Water Supply.—On Monday of last week, Mr. W. O. E. Meade King, M.Inst.C.E., held an inquiry at Sutton Valence, on behalf of the Local Government Board, respecting an application by the Hollingbourne Rural District Council for permission to borrow the sum of £500 for the purpose of extending the Sutton Valence Water-Works. Mr. H. J. Bracher, the Clerk, represented the District Council; Mr. Bennett appeared for the Parish Council, of which he is Chairman, and Mr. A. J. Ellis for the South Kent Water Company. Mr. Bracher, in the course of his statements, estimated the population of Sutton Valence at about 1000, and the assessable value of the parish at £4828. In the year 1876, water and drainage works were provided for the village; a total sum of £3911 being borrowed for the purpose, of which £1794 was still outstanding. The Council proposed to expend the £500 in raising the existing tank, making new headings in the well, and laying new mains; and the Council looked forward to the water consumers paying the £500, which it was proposed to borrow for a period of thirty years. The price now charged for supply by meter was 1s. per 1000 gallons up to 40,000 gallons, and 9d. per 1000 beyond that amount. Mr. Wood, who had been entrusted with the work of extending the supply, said about 4000 gallons of water were pumped at the present time. He proposed to make another heading and extend the existing one, by which means he believed a much larger supply would be obtained. Mr. Coveney opposed the scheme on the ground that it would be useless to spend £500 if there was no water. Mr. Ellis proved that the South Kent Company had offered to supply the Council with water which they would obtain from the Mid-Kent Company at 1s. 3d. per 1000 gallons, and that they would make no charge for extending their mains to Sutton Valence. Mr. E. Easton, Deputy-Chairman and Engineer of the South Kent Company, said his Company had an inexhaustible supply of water, having entered into a contract with the Mid-Kent Company. Their works were at Banbridges, about 12 miles from Sutton Valence. Mr. Bracher then addressed the Inspector, and said the offer of the South Kent Company to supply Sutton Valence with water at 1s. 3d. per 1000 gallons was not a very liberal one, because after the water was pumped into the reservoir the Sutton Valence people would have to bear the whole cost of distributing it. He also doubted whether the Company would be able to get a continuous supply from the Mid-Kent Company. He contended that it would be for the benefit of the place if the proposed loan were sanctioned.

Messrs. C. & W. Walker have removed their London offices from Finsbury Square to 110, Cannon Street, E.C.

Liptons, Limited, who have been entrusted with the control of the commissariat department during the autumn manœuvres on Salisbury Plain, are having the marquees, stores, and canteens supplied with acetylene gas produced by "Incanto" generators.

At the exhibition held in connection with the congress of the Royal Institute of Public Health in Dublin, Mr. J. R. Wigham showed in operation his system of lighting buoys and beacons. He also exhibited his method of producing and burning acetylene gas with ordinary fish-tail and argand burners.

The Australasian Incandescent Gas-Light Company, Limited, have taken up the sole sale of Clay's anti-vibratory fittings for incandescent gas-burners in the Australasian Colonies; and the Société Française d'Incandescence par le Gaz, of Paris, have acquired the exclusive right to manufacture and sell the fittings in France.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

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O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.

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Telegrams: "Volcanism, London."

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JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special attention to Repairs.
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First-Class Award, Melbourne Exhibition, 1899, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
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JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

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[For Illustrated Advertisement, see Aug. 2, p. 278.]

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.
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Correspondence invited.

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To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
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WANTED, at once, a Steady Young Man as GAS STOKER in small Works. Permanent Situation. Wages 25s. per week.
Apply to the MANAGER, Gas-Works, Raunds, Thrapston, NORTHANTS.

SEAFORD GAS-WORKS, SUSSEX.
WANTED, a Stoker used to Shovel Charging, and to make himself generally useful. Must be steady, industrious, and reliable.
Apply, with *copy* of Testimonial from last Employer, to JAMES COWNEY, Manager.

WANTED, a Young Man as general GAS-FITTER. Must have good experience in Automatic House Fitting. Also required to assist in the reading of Meters. Wages, 30s. per week.
Apply, by letter only, stating Experience, to Mr. A. H. GODWIN, Manager, Watford Gas and Coke Company, WATFORD.

WANTED, a thoroughly competent WORKING ENGINEER, to manage "Otto" Gas-Engine and Pumps, Tap Mains, &c. Salary 30s. per week.
Apply by letter, stating Age and Experience, and with *copy* of Testimonials, to the SECRETARY, Water-Works Company, Amersham, BUCKS.

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Morocco Gilt, 21s.; Roan Gilt, 18s.

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OF THE
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This Edition of the "Handbook for Gas Engineers and Managers" is a great improvement on all previous editions. Much of the text has been re-written, in order to keep the work abreast of the constant advances that are being made in the Gas Industry. About fifty additional Illustrations are given; and a Steel-Plate Engraving of William Murdoch, the Inventor of Gas Lighting.

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Introduction; Chief Kinds of Coal; Analyses of Coals and Cannels; Storage of Coal; Spontaneous Ignition of Coal; Gases Occluded in Coal; Testing of Coal for its Producing Qualities; Gas Production; Retort-House; Inclined or Sloping Retorts; Retort-Stack; Retorts; Retort-Settings; Regenerative System of Heating Retorts; Flues and Draught; Analysis of Furnace Gases; Retort-Bench Mountings; Hydrocarbon and other Gases and Vapours; Retort-House Tools and Appliances; Machine Charging and Drawing; Condensation; Naphthalene; Condensers; Exhausters; Steam Engines and Boilers; Washers; Tower Scrubbers; Washer-Scrubbers; Bye-Pass Mains and Valves; Tar and Liquor Wells and Tanks; Purification; Purifying-House; Purifiers; Limestones and Lime Burning; Station Meter and other Indicating and Recording Apparatus; Gasholder Tanks; Gasholders; Governors; Main-Pipes; Main-Pipe Joints; Wrought-Iron and Steel Main-Pipes; Laying of Main-Pipes; Discharge of Gas through Main-Pipes; Service-Pipes and Fittings; Public Lighting; Consumers' Gas-Meters; Testing-Meters; Internal Fittings; Gas Testing Appliances and Methods; Tests for Impurities; Illuminating Power; The Aerorthometer; Foreign and other (proposed) Home Standards of Light; Jet Photometers; Specific Gravity of Gas; Enrichment of Coal Gas; Public Illuminations; Coloured Fires; Illumination Devices; Use of Gas for Purposes other than Lighting; Residual Products; Coal Tar; Ammoniacal Liquor; Sulphur Recovery; Coal Products; Elementary Substances; Chemical and other Memoranda; The Gas Industry; Cost of Gas-Works; Miscellaneous; Bricks and Brickwork; Mortar and Concrete; Iron, Steel, and other Metals; Velocity and Force of the Wind; Office Memoranda; Epitome of Mensuration; Arithmetical and Algebraical Signs; Multipliers; Table of Diameters, Circumferences, Areas of Circles and Sides of Equal Squares; Weights and Measures; French Weights and Measures—Decimal System; Money Tables.

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GAS STOKER.
WANTED, a Stoker for small Gas-Works (Shovel Charging). Twelve-hour Shifts, eight months; Eight-hour Shifts, four months. Wages, 26s. per week; 6d. per hour overtime.
Apply, stating Age, Height, and Reference, to J. TALL, Manager, Gas-Works, DARTMOUTH.

UCKFIELD GAS COMPANY.
WORKING Manager wanted immediately, for small Works in the Country. Make about 6 Millions. Particulars of duties will be furnished.
Applications, with *copies* of three Testimonials, and stating Wages required, to be sent to me by the 5th of September next.
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Secretary.
Uckfield, Sussex,
Aug. 18, 1898.

GAS CARBON Wanted, not less than 4-Ton Loads.
Apply to the BRIMINGTON CARBON COMPANY, Bowerby Bridge, YORKS.

WANTED, Carbon in 4 Ton Lots, or more; also OIL CARBON.
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FOR SALE, Village Gas-Works (Eastern Counties), by Private Treaty.
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GASHOLDER, 35 feet diameter by 14 feet deep, with five strong Cast Columns, Wrought Lattice Girders, and Counterbalance. Erected 1892. Cheap, if sold immediately.
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FOR SALE—One 8-inch Crossley STATION GOVERNOR, and One 6-inch Parkinson STATION GOVERNOR, with all Valves and Connections.
Further Particulars from ARTHUR GRAHAM, Gas and Water Manager, MANSFIELD.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. **Compare Prices and Particulars before ordering elsewhere.**
J. F. BLAKELEY, Gas Engineer, Ravensthorpe, YORKS.

COUNTY BOROUGH OF WIGAN.
TO TAR DISTILLERS AND OTHERS.
THE Gas Committee of the Wigan Corporation invite TENDERS for the surplus TAR produced at their Gas-Works for One Year commencing on the 1st of September next, and terminating on the 31st of August, 1899.
Particulars and Form of Tender may be obtained on application to the undersigned.
The highest or any Tender not necessarily accepted.
Tenders, sealed and endorsed "Tar," to be delivered to J. J. Charnock, Esq., Town Clerk, on or before the 19th prox.
J. TIMMINS,
Engineer.
Borough Gas-Works, Wigan,
Aug. 25, 1898.

TO CONTRACTORS.
GASHOLDER TANK.
THE Edinburgh and Leith Corporations' Gas Commissioners are prepared to receive TENDERS for the EXCAVATORS', CONCRETORS', BRICKLAYERS', and MASONS' WORK in connection with the construction of a BRICK and PUDDLE GASHOLDER TANK, 252 ft. 6 in. diameter by 37 feet deep at their New Works at Granton, near Edinburgh.
Specification and Schedule of Quantities may be obtained on application to the Engineer, Mr. W. R. Herring, on payment of a sum of £5, which will be returned on receipt of a *bond-fide* Tender. The Drawings and Sections may be inspected, and any further Information obtained upon application to the Engineer at his Office, New Street, Edinburgh.
Tenders are to be lodged by Ten a.m. on the morning of the 17th day of October, endorsed "Tender for Gasholder Tank," and addressed to the undersigned.
The Commissioners do not bind themselves to accept the lowest or any Tender.
JAMES M'G. JACK,
Clerk to the Gas Commissioners.
25, Waterloo Place, Edinburgh.

CORPORATION OF LEICESTER.
SULPHURIC ACID.
THE Gas and Electric Lighting Committee of the above Corporation are prepared to receive TENDERS for the supply of SULPHURIC ACID, made either from native Sicilian Brimstone, recovered Sulphur, or Pyrites. Specific gravity in each case to be stated.
The Price to include free delivery by rail into elevated Tanks, 27 feet high, at the Chemical Works, Aylestone Road.
Probable Quantity about 1700 Tons; to be delivered as required during the ensuing Twelve Months.
Tenders, addressed to Alderman Lennard, Chairman, and endorsed "Tender for Acid," to be delivered at these Offices not later than Eleven o'clock a.m., on Saturday, Sept. 10.
The Committee do not bind themselves to accept the lowest or any Tender.
ALFRED COLSON, M.Inst.C.E.,
Engineer and Manager.
Offices: Millstone Lane,
Leicester, Aug. 18, 1898.

HAWORTH URBAN DISTRICT COUNCIL.

THE above Council are prepared to receive TENDERS for the CONVERSION of an old STONE GASHOLDER TANK into a TAR and LIQUOR TANK, as per Plans and Specifications prepared by the Gas-Works Engineer.

Further Particulars may be obtained on application to the Gas-Works Manager, Gas-Works, Haworth.

Sealed Tenders, marked "Tar Tank," to be delivered to me the undersigned not later than the 2nd of September, 1898.

WM. ROBERTSHAW,
Clerk to the Council.

1, Burlington Chambers, Keighley.

KNARESBOROUGH URBAN DISTRICT COUNCIL.

THE above Council are prepared to receive TENDERS for the supply and delivery, during the ensuing Twelve Months, of about 1600 Tons of screened GAS COAL, in Monthly quantities as required.

They are also prepared to receive OFFERS for the purchase of the TAR and AMMONIACAL LIQUOR made at the above Council's Works during the same Period.

Tenders to be in by the first post on the 5th of September, addressed to

T. MAINMAN,
Clerk to the Council.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held MONTHLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by Auction of Gas and Water Stocks and Shares under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. Alfred Richards's Offices, 18, FINSBURY CIRCUS, E.C.

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THIS Material is of full Strength, and Exceptional Activity. It is specially prepared to minimise Back-Pressure; and will be supplied on Hire, or Sold, on the most favourable Terms.

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Illuminating Power 16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality) 13¾ Cwt. per Ton.
Sulphur . . . . . A little over 1 per Cent.
Ash . . . . . Under 1 per Cent.
Tar . . . . . 163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor 103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

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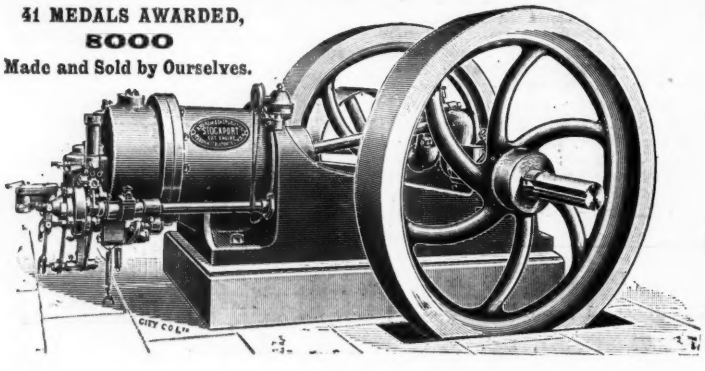

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SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

Trade Mark: "SILICA."

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GREATER DURABILITY,

Strongly recommended where EXCESSIVE HEATS have to be maintained.

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For use in the

RECOVERY OF SULPHUR,

ALSO

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Analysis made by

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Yield of Gas per Ton	10,500 Cub. Ft.
Illuminating Power	16·9 Candles.
Coke (of good quality)	67·5 per Cent.
Sulphur	0·58 „
Ash	2·73 „

For Price, &c., apply to the

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INCANDESCENT GAS LIGHTING

Has now gained a complete and final Victory over its last and greatest Enemy

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See "JOURNAL OF GAS LIGHTING," July 7, 1896, p. 19, and Dec. 21, 1897, p. 1365.

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GAS ENGINEERS' AGENTS AND CONTRACTORS FOR Meters, Fire-Clay Goods, Oxide of Iron, and all other Gas Apparatus. Retort Carbon purchased.

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ANALYSIS.

Yield of Gas per ton	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

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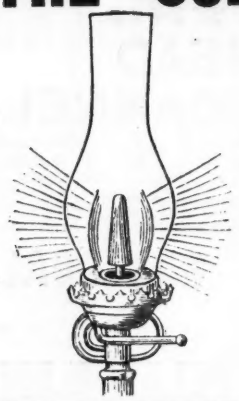

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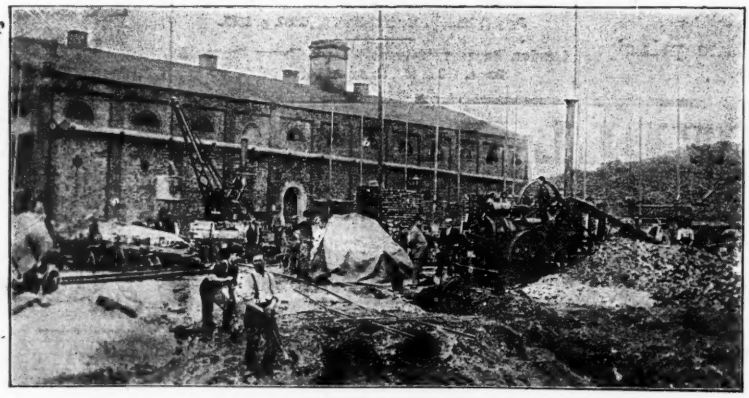

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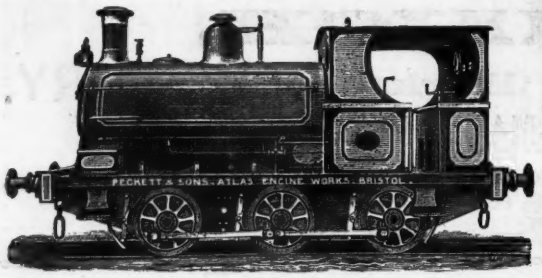

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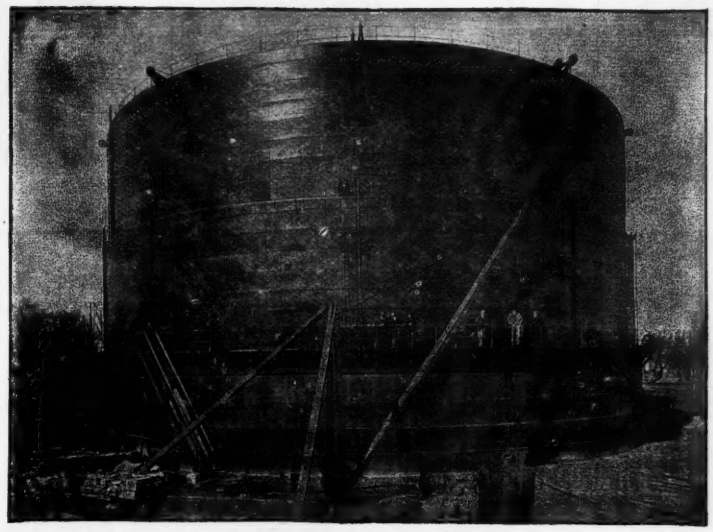

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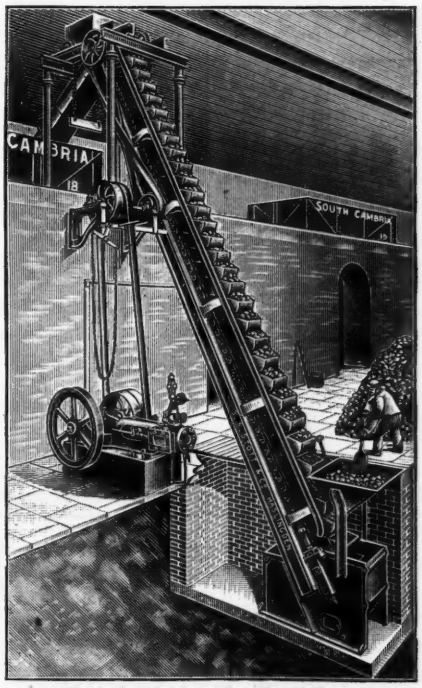

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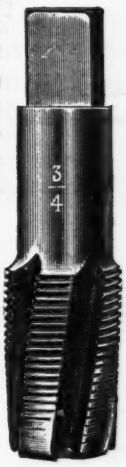

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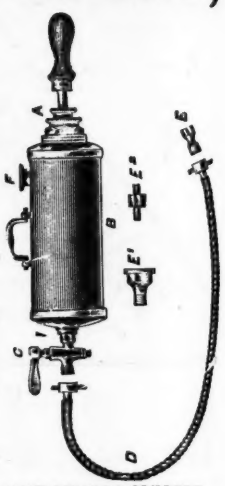

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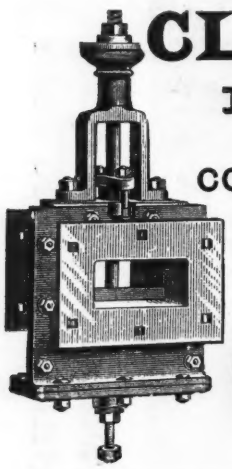

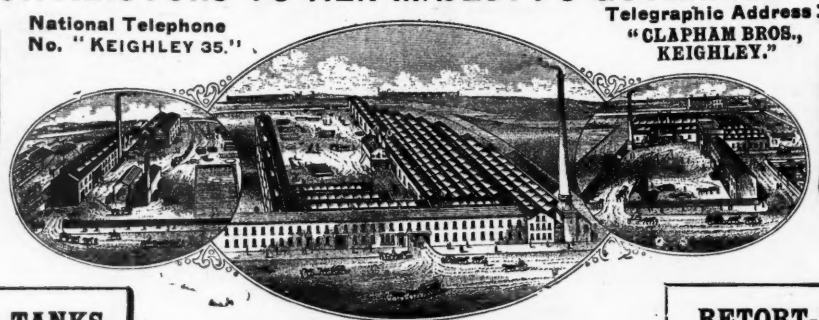

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